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FINAL REPORT

ESTABLISHING PHYSICAL CRITERIA FOR ASSIGNING PERSONNEL TO AIR FORCE JOBS

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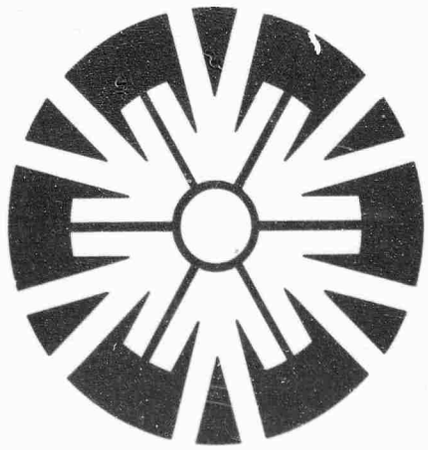

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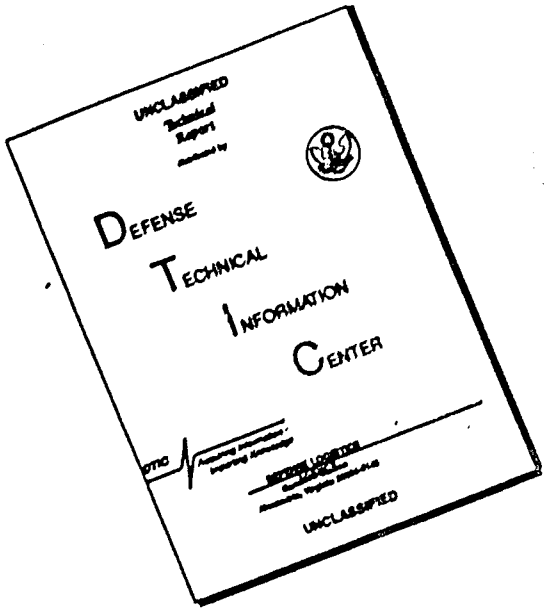

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This report presents a comprehensive summary of the activities and accomplishments of the contractor, the Institute for Ergonomics Research, Texas Tech University, during the four years of the project. Working under the sponsorship of the Air Force Office of Scientific Research and the technical monitorship of the Aerospace Medical Research Laboratory, the contractor's program was directed toward improving the Air Force's present capability to select and assign personnel to Air Force Specialty Codes (AFSCs). This was
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accomplished through the development of an objective criterion with which the Air Force can evaluate the compatibility of an individual's ability to successfully perform a selected set of well defined demanding task within a wide variety of Air Force career fields and jobs.

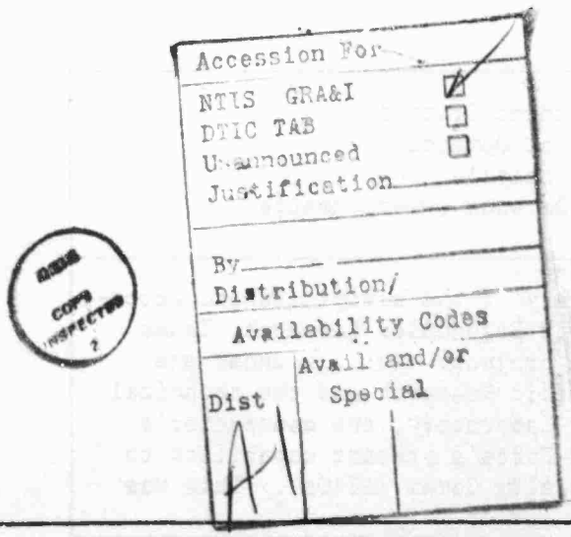
Physically demanding tasks within AFSCs have been identified through use of a survey administered by the AF Human Resources Laboratory. Starting with the most demanding AFSCs, working supervisors were interviewed throughout the United States including Alaska and Hawaii. Following the interview, a visit was made to the workplace to obtain actual measurements of task demands as field validations. These field validations were made in 157 AFSCs.

Data collected during these visits were used to categorize the task demands of AFSCs. The manual material handling activities of lift/lower, push/pull, carry, and hold accounted for the vast majority of the demanding activities. These activities were subcategorized for performance measures into simulated tasks that are common across AFSCs.

Candidate tests were then developed which would measure an individual's ability to perform the simulated tasks and, therefore, the related AFSCs' activities. Laboratory tests were conducted to relate performance on the candidate tests to performance on the simulated tasks.

Based on these results, a group of candidate tests were selected. Incumbents at ten different Air Force Bases were tested using the candidate tests and the developed simulated tasks. Scores on the tests and simulated tasks were used to develop regression equations to predict test scores needed to perform activities of certain demands. Based on these regression equations, an assignment criterion was finalized using a single test, the 6 foot incremental lift (X1). The X1 test was the best single predictor of success on the various AFSCs activities. Additional tests could be added, however, with greatly diminishing returns.

The assignment criterion takes into account these three factors to weight the various tasks in an AFSC. These are: (1) the percent of airmen performing the tasks, (2) frequency of task performance, and (3) the task criticality. In addition the final AFSCs demand scores were adjusted for the number of airmen requested for the AFSC.



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SUMMARY

This report presents comprehensive documentation of the activities and accomplishments of the contractor, the Institute for Ergonomics Research (formerly the Institute for Biotechnology), Texas Tech University, during the four years of the project. Working under the sponsorship of the Air Force Office of Scientific Research and the technical monitorship of the Air Force Aerospace Medical Research Laboratory, the contractor's program was directed toward improving the Air Force's present capability to select and assign personnel to Air Force Specialty Codes (AFSCs). This was accomplished through the development of an objective criterion with which the Air Force can evaluate the compatibility of an individual's ability or inability to successfully perform a selected set of well defined demanding tasks within a wide variety of Air Force career fields and jobs.

Physically demanding tasks within AFSCs have been identified through use of a survey administered by the AF Human Resources Laboratory (HRL). Starting with the most demanding AFSCs, working supervisors in these AFSCs were interviewed throughout the United States including Alaska and Hawaii. Following the interview, a visit was made to the supervisor's workplace to obtain actual measurements of task demands by physical activity breakout. Field validations were made in approximately 157 AFSCs and AFSC shredouts. Sedentary AFSCs with no physically demanding tasks were not surveyed beyond the questionaire level. Therefore, a sampling approach was taken to evaluate a sufficient number of these AFSC's to confirm they were not physically demanding. Thereafter, no further attempt was made to evaluate the remainder of the X-factor three AFSC's due to the time constraints remaining in the fiscal year, and the apparent trend of light physical demands.

Data collected during these base visits were used to categorize the task demands of the AFSCs. The manual material handling activities of lift/lower, push/pull, carry, and hold accounted for the vast majority of the demanding activities. These activities were subcategorized for performance measures into simulated tasks that were common across AFSCs.

Candidate strength and endurance tests were developed which would measure an individual's ability to perform the simulated tasks and predict performance in the related AFSCs' activities. Laboratory tests were conducted to assess the feasibility of the candidate tests and to establish initial relationships between the strength and endurance tests and performance on the series of simulated tasks. Incumbents at nine different AF bases were then tested using the modified candidate tests and simulated tasks. The incumbent scores were used in conjunction with the task demand data from the field trips to establish the final assignment criterion.

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I. INTRODUCTION

A. BACKGROUND

Rationale

There are many AFSCs (Air Force Specialty Codes) career fields in the Air Force, which are composed of tasks requiring heavy or very heavy manual work. There has always been a problem of individuals within an AFSC being physically unable to perform these tasks. In the past, these individuals have been reassigned to lighter tasks compatible with their physical abilities since there were enough less demanding tasks available to accomodate them. With the entry of a larger proportion of females and weaker males into the Air Force, this problem has increased. Many recruits (both male and female) do not have the required strength and/or endurance to satisfactorily perform all Air Force tasks. Therefore, a strength aptitude test battery has been recommended to aid in improving the assignment of AF personnel to jobs based on their physical abilities.

With the advent of volunteer enlistment instead of the draft, individuals may be guaranteed a specific assignment AFSC as an inducement. If they are unable to perform in that AFSC due to physical limitations and cannot be persuaded to cross train into another AFSC, they must be released from the service resulting in the loss of invested time and money. Even with cross training, more time and money must be spent on retraining.

There is another cost to the Air Force when individuals are missassigned. It has been shown that the frequency and severity of injuries are greater for individuals who are working in jobs which have demands approaching or exceeding their physical capacities (Ayoub et al., 1978). Some types of injuries, such as those to the back, may cause recurring problems to the individual for the rest of his life with subsequent decrements in performance and increased medical cost to the Air Force.

Thus to maintain job efficiency and reduce the incidence and severity of injuries, it is desirable for the Air Force to have an assignment criteria based on an individual's physical capacity to perform the required tasks.

Objective

The objective of this project was to develop and validate a criterion with which the Air Force could reliably evaluate the compatibility of an individual's physical capacities with the physical demands of the various Air Force Specialty Codes (AFSCs).

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The benefits derived by the Air Force from this capability are a reduction in early discharges due to the inability of the individual to physically qualify for an AFSC after enlistment; a corresponding decrease in training costs, both initial and cross-training, due to a lower probability of an individual's eventual failure in the AFSC; a reduction in injury related costs due to a fewer number of individuals performing physical work at levels near or exceeding their maximum safe capability to work; and a reduction in operating costs by improving the work force capacity relevant to the physical demands of the task.

B. OVERVIEW

The capability of the Air Force to select and assign personnel to AFSCs is crucial to their operational effectiveness. In order to coordinate the employment and placement of its personnel, the Air Force must match the capabilities and limitations of its personnel to the demands of their AFSCs through the development of a valid strength aptitude test battery.

Fundamental Concepts

There are three fundamental areas of concern in the development of a strength aptitude test battery. These are:

a) The development of a set of physical requirements referred to as the "physical demands" of the various AFSCs,

b) The measuring of physical abilities of individuals referred to as "physical capacities," and

c) The "compatibility" between the physical demands of the various AFSCs and the physical capacities of potential airmen entering a select career field.

Physical Demands

Each AFSC was viewed primarily as having a three tiered organizational structure (Figure 1) in which the tasks were subdivided into subtasks which in turn were subdivided into further breakout elements. For example, in the 551X0 career field (Pavements Maintenance) one of the tasks was to "maintain vegetated areas." That task consisted of subtasks such as obtaining a job order, obtaining a vehicle, removing a lawn mower from storage, obtaining gas, checking oil-gas, pushing the mower to vehicle, placing the mower in a vehicle, securing the mower, obtaining personal protective equipment, and mowing the vegetation. Each of these subtasks was subdivided into elements; for example, "placing the mower in a vehicle" required

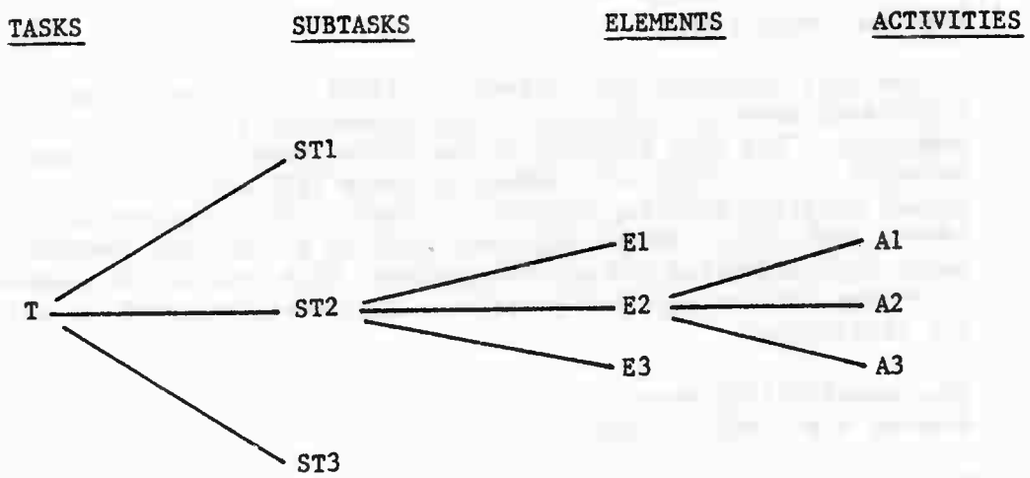


Figure 1. Organizational Structure of an AFSC

several activities such as stooping, grasping, lifting, carrying, and placing or positioning the mower to accomplish the required sub-task.

Task quantification was assessed at the element level; however, successful performance in an AFSC was evaluated based on the ability or inability of an individual to perform at the task level. Thus, when reference is made to the physical demands of an AFSC, these demands should be considered to reside at the task level.

Physical Capacities

Within this approach, the relevant physical attributes of an individual were the individual's anthropometry, strength, and endurance. The task analyses of the AFSCs showed that the vast majority of all physically demanding tasks fell within the category of Manual Material Handling Activities (MMHA). Thus the MMHA of lift, lower, push, pull, carry, etc. were applied to the task breakdown and hence identification and quantification. This reduced the number of different primary physical capacities considered relevant to successful preformance.

The Compatibility Between Physical Demands and Physical Capacities

The results of the interaction between a task or series of tasks and the individual attempting to perform these tasks is based on the compatibility of the physical demands of the tasks and the physical capacities of the individual.

Assumptions

There are three fundamental assumptions which formed the basis, for developing the "assignment criterion."

These assumptions are:

(a) If an individual possesses the physical capacities demanded by the tasks, then the individual is capable of safely performing the tasks;

(b) There is a direct correlation between the case where an individual can safely perform a given task or series of tasks and the amount by which the individual's relevant physical capacities exceed the physical demands of the task or series of tasks; and

(c) The physical demands of the AFSCs and the individual's physical capacities remain relatively constant during the period used to validate the criterion.

The first two assumptions provided the rationale for attempting to establish an objective criterion for assigning individuals to AFSCs. The third assumption provided for the stability necessary to properly achieve the validation of the assignment criterion.

Organization of the Approach

The methodology for accomplishing the objective of this effort was divided into four phases. Phases I, II, and IV cover the sequence of (I) analysis of Air Force Specialty Code, (II) development of strength/stamina apptitude tests, and (IV) development of the assignment criteria. Phase III is a supportive step for the other three phases dealing with equipment identification and appropriate hazard analysis. A brief summary of these phases is given below.

Phase I: Analysis of Air Force Specialty Codes to Quantify Tasks Requiring Significant Physical Demands

Phase I dealt with the identification and quantification of task demands for several AFSC's. The task analysis procedures included the use of two survey questionnaires, supervisor interviews, and physical measurements. The first survey questionnaire was used to rank order tasks within an AFSC according to qualitative task demands. From each AFSC's ordered list, twenty-five tasks were selected to be representative of the physically demanding tasks within the AFSC.

The second survey questionnaire was designed to obtain general estimates of the weights and forces required by specific types of activities (ie. lifting, pushing, etc.). Unfortunately the data were obtained under conditions that rendered them unusable for the project.

Detailed descriptions of task elements and estimates of associated weights and forces were obtained through supervisor interviews over the course of 47 base visits. Information was also acquired on the frequency of task performance and the percent of first and second term airmen who were currently assigned to that AFSC. The interview was followed by a verification visit to the duty station to quantify as many of the estimated weights and forces as possible.

Phase II: Strength/Stamina Aptitude Tests

Phase II was concerned with the identification and development of objective tests which could be used to evaluate an individual's maximum safe physical capacity to perform work. The test selection was based upon the physical capacities of individuals identified during the task analyses of Phase I as being relevant to successful task performance.

As expected, manual material handling activities accounted for most of the demanding activities identified by Phase I. These activities were subcategorized for performance measures into simulated tasks that were common across AFSCs. Lift/lower activities accounted for the majority of the MMHA. Many test candidates were evaluated as predictors of performance on these MMHA. A laboratory study was conducted to obtain comparison data between the simulated tasks and the candidate tests. Based on these results, simulated tasks and tests to be performed by a group of incumbents were selected. Incumbents at ten bases were then tested to obtain scores on the candidate tests and selected simulated tasks. The data were analyzed to establish the relationships between the two groups of data that could be used in developing the final assignment criterion.

Phase III: Defining Equipment for Strength/Stamina Aptitude Tests and Task Measurement

This phase dealt with the identification, testing and selection of any measurement equipment required in phases I, II, and IV. The relevant equipment and accessories, whether purchased or manufactured, underwent a preliminary hazard analysis in accordance with DI-H-3278, Section 10, paragraph 3. Only those items which complied with the specified criteria were used.

Phase IV: Finalization of the Assignment Criterion

This phase dealt with the finalization of the assignment criterion. The assignment criterion, as outlined in this section, is based on a single test score. The assignment criterion would preferably be based on two test scores to minimize the testing times at the entry stations. If two test scores are used, these will be:

(1) X1 the incremental 6' ft. lift, and
(2) X3 the 70 lb hold at elbow height.

If the assignment criterion is based on only one test score, X1, the incremental 6' ft. lift will be utilized.

II. PHASE I: ANALYSIS OF AIR FORCE SPECIALTY CODES TO QUANTIFY TASKS REQUIRING PHYSICAL DEMANDS.

Phase I dealt with the identification and quantification of task demands for the AFSCs. The task analysis procedures included the two survey questionnaires, supervisor interviews, and physical measurements or vertification of activities performed in the supervisor's work area.

A. SURVEY QUESTIONNAIRE 1

Survey Questionnaire 1 (also called the presurvey by the Air Force Human Resource Lab, (AFHRL), provided a ranking of tasks within AFSCs by physical demand. From each ranking, a representative sample could be obtained for use during the quantification of that AFSC.

Objectives of Survey Questionnaire 1

The objectives of survey Questionnaire 1 were:

(a) to provide a preliminary screening of tasks in each AFSC to identify tasks requiring physical demands,

(b) to rate the level of physical demands of each task according to a 10 point scale (0 to 9),

(c) to rank order the rated tasks to obtain a representative sample based on physical demands and to determine each AFSC's task demand distribution, and

(d) to amend the task list for each AFSC by adding any physically demanding tasks not included in the supplied task list.

Development of Questionnaire 1

Questionnaire 1 was developed through the joint effort of Texas Tech University and several concerned Air Force agencies (AFAMRL/HEG and AFHRL/MODS). The principal item of concern was the formulation of an operational definition of physical demands against which tasks could be rated. Although, consideration was given to the use of a five point scale, a nine point scale was selected. It was felt that nine levels would provide a better division of the tasks according to physical demands. Thus the rankings of the tasks by physical demand and the frequency distributions would be more descriptive of the individual AFSCs. Each point on the scale was defined by narrative description that included quantitative values of physical task demands representative of that level (See Table 1).

TABLE 1

RATING SCALE FOR PHYSICAL STRENGTH AND ENDURANCE USED IN QUESTIONNAIRE 1

Scale Point	Description of Effort
0	No Significant Physical Demand - Corresponding requirement would include periodic lifting of 9 lbs or less - includes most adminstrative and clerical tasks.
1	Extremely Light - Corresponding requirement would include periodic lifting of 10-19 lbs to a height of 5 ft OR an equivalent demand for frequent or continuous muscular effort.
2	Very Light - Corresponding requirement would include periodic lifting of 20-29 lbs to a height of 5 ft or an equivalent demand for frequent or continuous muscular effort.
3	Light - Corresponding requirement would include periodic lifting of 30-39 lbs to a height of 5 ft OR equivalent demand for frequent or continuous muscular effort.
4	Light to Moderate - Corresponding requirement would include Periodic lifting of 40-49 lbs to an height of 5 ft OR equivilent for frequent or continuous muscular effort.
5	Moderate - Corresponding requirement would include periodic lifting of 50-59 lbs to a height of 5 ft OR an equivalent demand for frequent or continuous muscular effort.
6	Moderate to Heavy - Corresponding requirement would include periodic lifting of 60-69 lbs to a height of 5 ft OR an equivalent demand for frequent or continuous muscular effort.
7	Heavy - Corresponding requirement would include periodic lifting of 70-79 lbs to a height of 5 ft OR an equivalent demand for frequent or continuous muscular effort.
8	Very Heavy - Corresponding requirement would include periodic lifting of 80-89 lbs to a height of 5 ft OR an equivalent demand for frequent or continuous muscular effort.
9	Extremely Heavy - Corresponding requirement would include periodic lifting of 90 lbs or more to a height of 5 ft OR an equivalent demand for frequent or continous muscular effort.
X	No knowledge of Task Requirement

The decision to emphasize manual materials handling requirements when developing these definitions was based on the results of a "mini-questionnaire" survey held at Reese and Dyess AFB. Details of this survey and a sample of the questionnaire are given in Appendix A. The results of this survey showed that 90 percent of the difficult tasks in the studied AFSCs fell into the manual materials handling category. These activities included lifting, lowering, pushing, pulling, and carrying. Lifting was considered to be one of the most demanding of these activities. Since people were more familiar with lifting objects of a known weight, they were able to accurately estimate lifting forces required by other manual handling activities. Therefore lifting activities were used to define the nine point scale used in Questionnaire #1 for task ratings. The opertional definitions describing each level of the scale are given in Table 1.

The tasks lists used with Questionnaire 1 were obtained from the Military Personnel Center, (MPC). These lists had been developed by MPC as part of their occupational surveys. These lists varied in length from 210 to 1375 tasks depending on the AFSC. Each supervisor was given the opportunity to add to the list any physically demanding tasks in his career ladder that were not included in the questionnaire and to rate them using the same scale.

In addition to the rating of these tasks, the supervisors were asked to estimate what percentage of all the work done by first term airmen could be categorized as very light, light, medium, heavy or very heavy work. Each supervisor also completed a background section providing information on his rank, time in the career field, etc. An abbreviated example of Questionnaire 1 is given in Appendix B. The general instructions for the questionnaire were prepared by HRL with assistance from TTU.

Administration of Questionnaire 1

Administration of Questionnaire 1 was conducted by AFHRL. They obtained the task lists from MPC, printed the questionnaire booklets, selected the AFSCs and bases for participation, and distributed and collected the booklets through the assistance of the base personnel offices.

A "wave concept" was employed in administering Questionnaire 1. Working in waves of about 45 AFSCs, the questionniare was adminstered to approximately 40-50 supervisors in each AFSC career field. The first wave covered what was believed to be the most demanding AFSCs as determined by the Armed Services X-Factor Classification system in use at that time. The second wave included the remaining heavy AFSCs and a sample of all remaining AFSCs, regardless of demand. From the third wave on, the AFSCs were again selected in order of the most physically demanding. These waves also set the "pattern" for the waves used in administering Questionnaire 2.

Analysis of Questionnaire 1

Data from Questionniare 1 consisted primarily of the ratings of tasks by supervisors. Analyses were performed by AFHRL to obtain mean ratings and to rank order the tasks within each AFSC according to the mean ratings. A mean rating is the average of the ratings given to a task by the supervisors. The demand scale from 0 to 9 was divided into smaller subintervals with a size of 0.10 each yielding 90 intervals of mean ratings (i.e. 0.0-0.1, 0.1-0.2, ..., 8.9-9.0.).

A frequency count was carried out for the mean ratings in each subinterval to obtain the task frequency distribution for an AFSC. The shapes of the AFSC task distributions were found to resemble the following distributions:

a. exponential distribtuion,
b. bell-shaped or normal distribution, and
c. a distribution with a heavy tail to the right.

To illustrate these distributions, the histograms for three AFSCs have been selected. Examples A (Table 2 and Figure 2) for AFSC 328X4: Avionic Inertial and Radar Navigation Systems depicts an exponential distribtuion. Example B (Table 3 and Figure 3) for AFSC 431x0: Helicopter Maintenance shows a bell-shaped distribution. Example C (Table 4 and Figure 4) for AFSC 472x3: Vehicle Maintenance illustrates a distribution having a heavy right tail.

SURVEY QUESTIONNAIRE 2

Survey Questionnaire 2 was originally planned to be a detailed follow-up survey for representative tasks from Questionnaire 1 and to obtain quantitative estimates of task demands which would be verified with later field study data. In the process of development, Questionnaire 2 became a two part survey; the first developed solely by AFHRL for their use and the second developed by TTU in conjunction with AFHRL for the quantification of AFSCs demands.

In the AFHRL section of the survey, the supervisor was requested to rate (using two 9-point scales) the strength and endurance required to perform a specified task for each type of effort involved (lift/lower, carry, push/pull, etc). The TTU section asked the individual to rate the same specified activities using a scale based on weight, and characterize the activity according to the type of activity, repetitions, rate, posture, distance, and time required to complete the activity. The discussion in this report of the objectives and development of Questionnaire 2 will be limited to the TTU section.

TABLE 2

EXAMPLE OF AN EXPONENTIAL FREQUENCY DISTRIBUTION OF TASK DEMANDS
(AFSC 328X4, AVIONIC INERTIAL AND RADAR NAVIGATION SYSTEM)

Mean Rating	Frequency	Mean Rating	Frequency	Mean Rating	Frequency
0.0-0.1	1	2.1-2.2	5	4.2-4.3	0
0.1-0.2	28	2.2-2.3	8	4.3-4.4	1
0.2-0.3	25	2.3-2.4	2	4.4-4.5	1
0.3-0.4	18	2.4-4.5	3	4.5-4.6	2
0.4-0.5	15	2.5-2.6	3	4.6-4.7	0
0.5-0.6	11	2.6-2.7	5	4.7-4.8	2
0.6-0.7	7	2.7-2.8	3	4.8-4.9	0
0.7-0.8	10	2.8-2.9	2	4.9-5.0	2
0.8-0.9	9	2.9-3.0	3	5.0-5.1	1
0.9-1.0	0	3. -3.1	1	5.1-5.2	0
1.0-1.1	6	3.1-3.2	3	5.2-5.3	0
1.1-1.2	3	3.2-3.3	3	5.3-5.4	0
1.2-1.3	3	3.3-3.4	2	5.4-5.5	0
1.3-1.4	7	3.4-3.5	2	5.5-5.6	0
1.4-1.5	2	3.5-3.6	2	5.6-5.7	1
1.5-1.6	2	3.6-3.7	3	5.7-5.8	0
1.6-1.7	5	3.7-3.8	1	5.8-5.9	0
1.7-1.8	5	3.8-3.9	2	5.9-6.0	0
1.8-1.9	3	3.9-4.0	1	6.0-6.1	0
1.9-2.0	1	4.0-4.1	3	6.1-6.2	1
2.0-2.1	7	4.1-4.2	2	6.2-6.3	0
				6.3-6.4*	1

*Frequencies in other subintervals are zero.

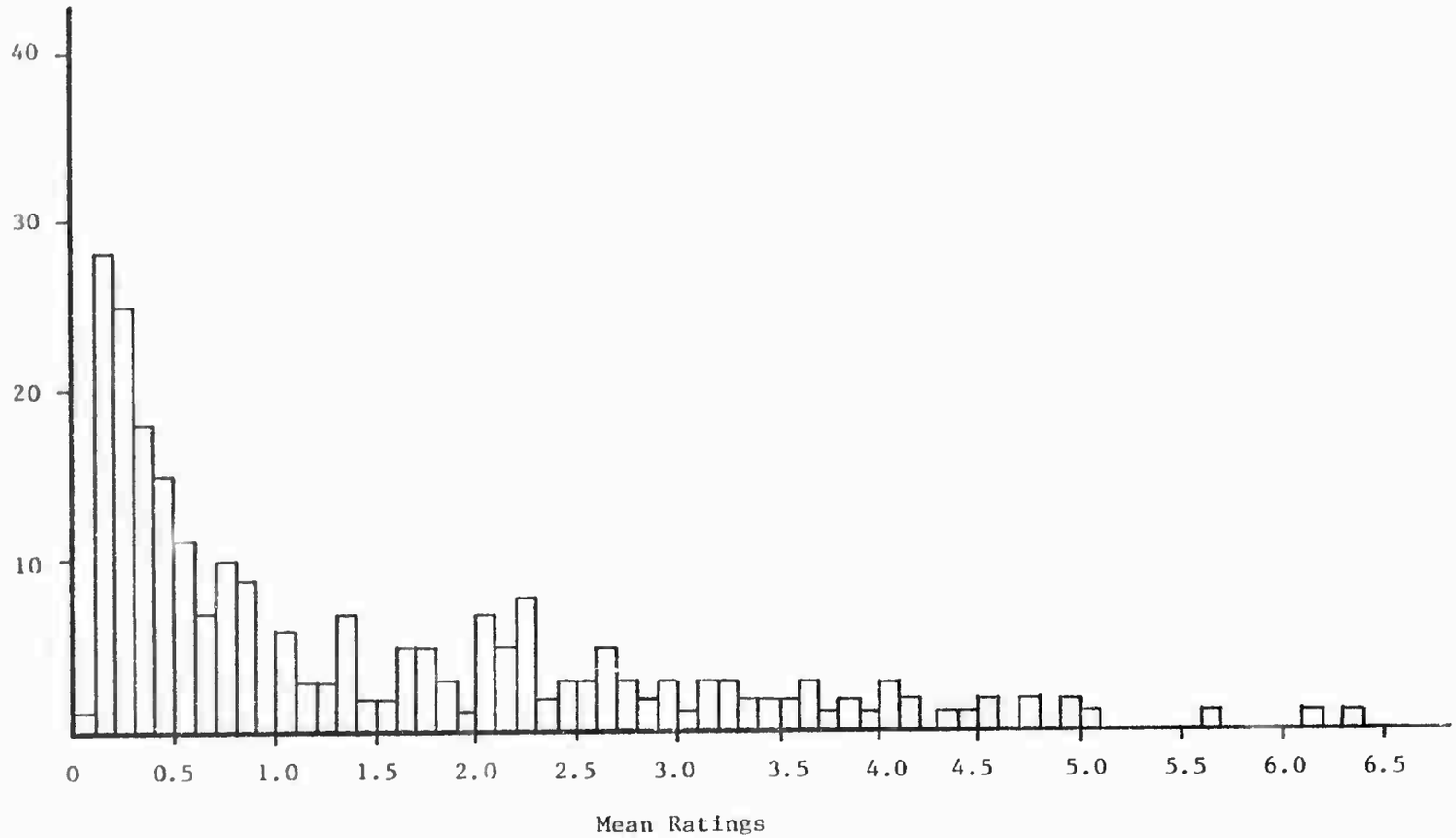


Figure 2. Histogram of Task Mean Ratings Showing an Exponential Distribution. (AFSC 328X4, Avionic Inertial and Radar Navigation Systems).

TABLE 3

EXAMPLE OF AN BELL SHAPED FREQUENCY DISTRIBUTION OF TASK DEMANDS
(AFSC 431X0, HELICOPTER MAINTENANCE)

Mean Rating	Frequency	Mean Rating	Frequency	Mean Rating	Frequency
0.0-0.1	1	1.9-2.0	21	3.8-3.9	5
0.1-0.2	0	2.0-2.1	36	3.9-4.0	3
0.2-0.3	0	2.1-2.2	18	4.0-4.1	9
0.3-0.4	3	2.2-2.3	39	4.1-4.2	11
0.4-0.5	10	2.3-2.4	32	4.2-4.3	5
0.5-0.6	8	2.4-2.5	21	4.3-4.4	5
0.6-0.7	14	2.5-2.6	27	4.4-4.5	6
0.7-0.8	18	2.6-2.7	26	4.5-4.6	3
0.8-0.9	15	2.7-2.8	19	4.6-4.7	4
0.9-1.0	24	2.8-2.9	25	4.7-4.8	6
1.0-1.1	26	2.9-3.0	13	4.8-4.9	2
1.1-1.2	30	3.0-3.1	16	4.9-5.0	7
1.2-1.3	26	3.1-3.2	15	5.0-5.1	5
1.3-1.4	43	3.2-3.3	16	5.1-5.2	6
1.4-1.5	23	3.3-3.4	13	5.2-5.3	0
1.5-1.6	27	3.4-3.5	9	5.3-5.4	2
1.6-1.7	23	3.5-3.6	12	5.4-5.5	2
1.7-1.8	26	3.6-3.7	9	5.5-5.6	2
1.8-1.9	39	3.7-3.8	8	5.6-5.7	2
				5.7-5.8*	1

* Frequencies in other subintervals are zero.

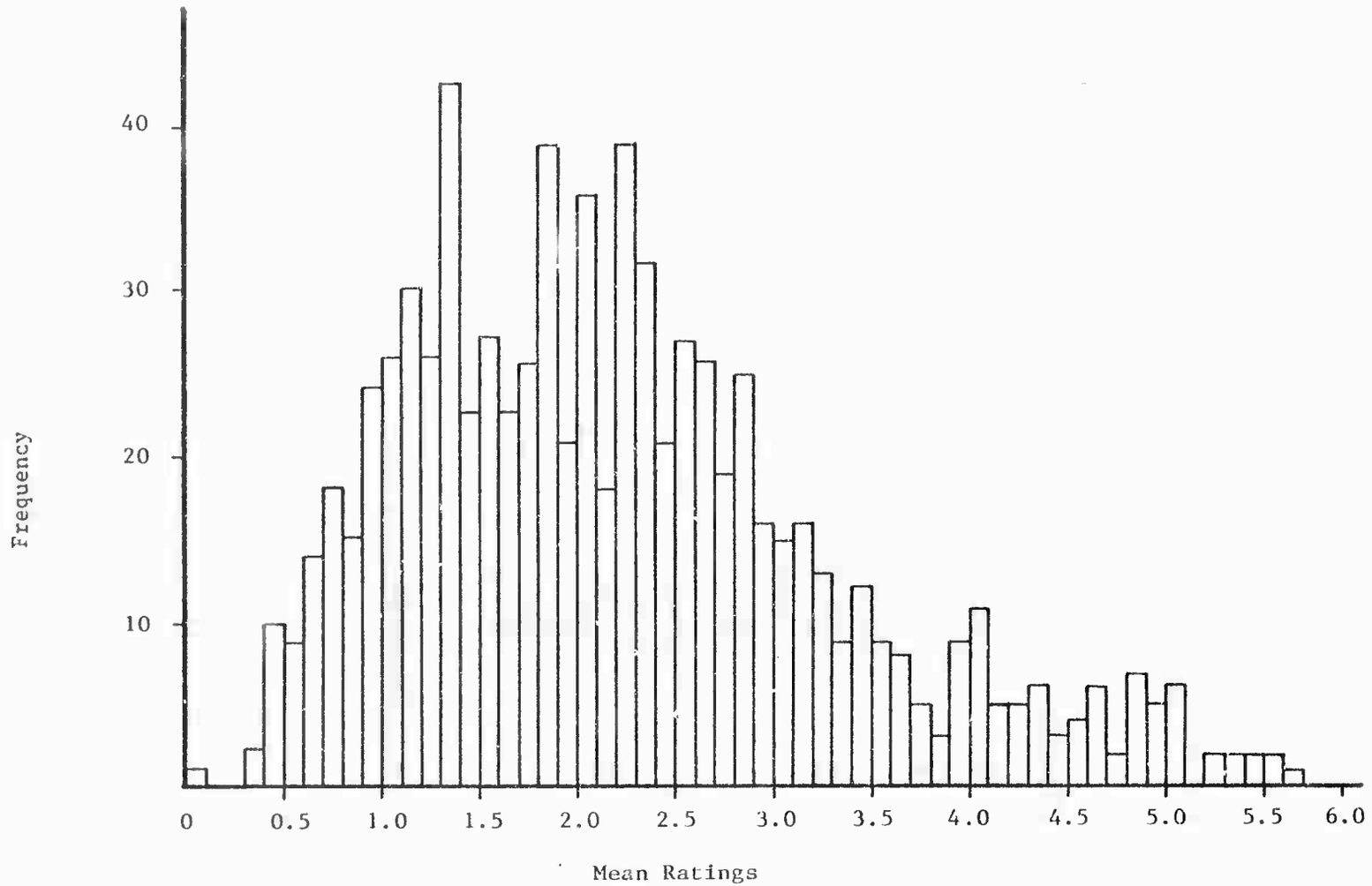


Figure 3. Histogram of Tasks Mean Ratings Showing a Bell-shaped Distribution. (AFSC 431X0, Helicopter Maintenance).

TABLE 4

EXAMPLE OF AN FREQUENCY DISTRIBUTION OF TASK DEMANDS WITH HEAVY TAIL TO THE RIGHT (AFSC 472X3, VEHICLE MAINTENANCE)

Mean Rating	Frequency	Mean Rating	Frequency	Mean Rating	Frequency
0.0-0.1	0	2.5-2.6	13	5.0-5.1	9
0.1-0.2	1	2.6-2.7	11	5.1-5.2	2
0.2-0.3	10	2.7-2.8	15	5.2-5.3	6
0.3-0.4	12	2.8-2.9	17	5.3-5.4	6
0.4-0.5	18	2.9-3.0	13	5.4-5.5	6
0.5-0.6	24	3.0-3.1	14	5.5-5.6	3
0.6-0.7	30	3.1-3.2	14	5.6-5.7	3
0.7-0.8	27	3.2-3.3	18	5.7-5.8	1
0.8-0.9	17	3.3-3.4	13	5.8-5.9	1
0.9-1.0	8	3.4-3.5	11	5.9-6.0	2
1.0-1.1	18	3.5-3.6	8	6.0-6.1	2
1.1-1.2	15	3.6-3.7	15	6.1-6.2	1
1.2-1.3	14	3.7-3.8	5	6.2-6.3	2
1.3-1.4	13	3.8-3.9	12	6.3-6.4	3
1.4-1.5	7	3.9-4.0	9	6.4-6.5	3
1.5-1.6	12	4.0-4.1	12	6.5-6.6	2
1.6-1.7	17	4.1-4.2	12	6.6-6.7	2
1.7-1.8	17	4.2-4.3	13	6.7-6.8	2
1.8-1.9	10	4.3-4.4	10	6.8-6.9	0
1.9-2.0	8	4.4-4.5	8	6.9-7.0	2
2.0-2.1	18	4.5-4.6	11	7.0-7.1	0
2.1-2.2	15	4.6-4.7	5	7.1-7.2	0
2.2-2.3	12	4.7-4.8	7	7.2-7.3	0
2.3-2.4	11	4.8-4.9	12	7.3-7.4	1
2.4-2.5	15	4.9-5.0	5	7.4-7.5*	3

* No frequencies for other subintervals.

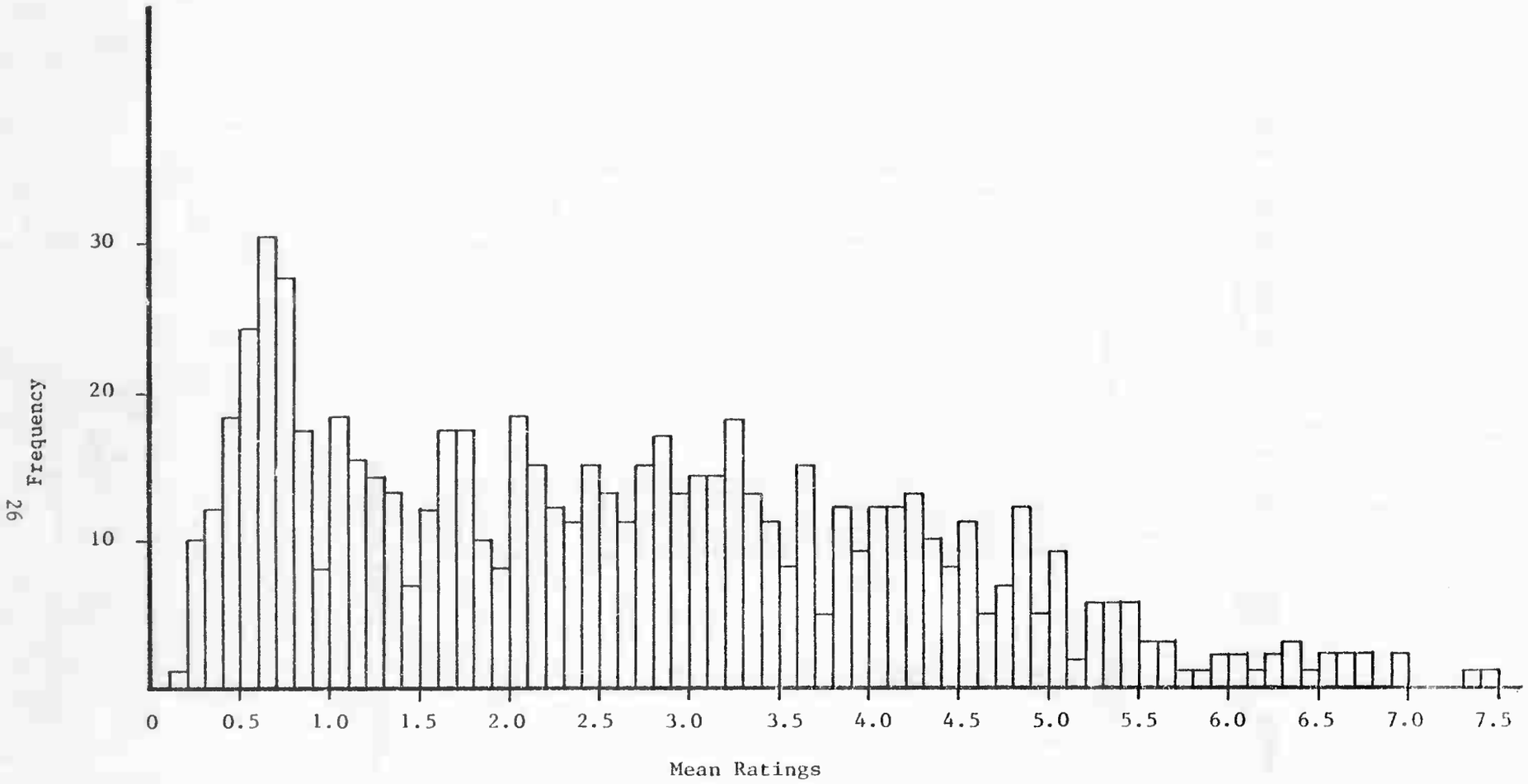


Figure 4. Histogram of Task for Mean Ratings Showing a Heavy Tail to the Right. (AFSC 472X3, Vehicle Maintenance).

Objectives of Questionnaire 2

The objectives of Questionnaire 2 were:

(a) to collect quantitative estimates of weights and forces required to perform AFSC tasks identified as physically demanding,

(b) to obtain supporting data on body posture, frequency of lift, task duration, etc. for these tasks, and

(c) to obtain general task information on percent participation, frequency of task performance, etc.

Development of Questionnaire 2

Questionnaire 2 was designed to be an adaptation of a study done by Arbeit and Schaefer (1977). They showed that experienced people usually accurately estimate quantitative values for specific job demands. However, their study involved the use of personal interview rather than a questionnaire format. Therefore a field validation of Questionnaire 2 was planned wherein field interviews with verification of weights and forces would be conducted and the data compared to Questionnaire 2 data.

The development of Questionnaire 2 centered around the aforementioned activities involving manual materials handling. These representative activities chosen were lift/lower, push/pull, and carry. Torque (or turning) activities were also included as they had been identified in the mini-survey (Appendix A) as demanding for some individuals. Questionnaire 2 was designed to obtain specific information about task demands. In addition to weight or force, other factors such as height and frequency of lift, body posture, and duration were included. The questionnaire originally prepared with the help of AFAMRL was designed so that the supervisor could give specific estimates as answers to the questions.

Based on a pilot administration of Questionnaire 2, it was found that the total time to complete a survey consisting of 25 questions (assuming an expected 50 percent response to all questions as determined in the sample survey) was approximately 2 hours. Modifications were recommended and forwarded to AFHRL for use to improve questionnaire 2 survey. An example of questionnaire 2 is shown in Appendix C.

Selection of Tasks for Use in Questionnaire 2

For each AFSC there are numerous tasks, in most cases hundreds of detailed tasks. Each task may require various levels of physical strength and/or stamina. Using Questionnaire 1, these tasks were rated on a physical demand scale ranging from 0 to 9. A task rated at

9 was clearly a significantly demanding task whereas a task rated at 0 was not considered to require any physical stamina or strength. Since it was desired to choose a representative sample of many tasks available, the possible candidates for selections were those that fell at 2.5 or above on the demand scale. The more demanding tasks are considered to be those that fell within the higher portion of the scale, at about 5.0 or above.

To obtain this representative sample, the range 2.5 to 9.0 was divided into subintervals, namely 2.5-3.0, 3.0-3.5, ..., 8.5-9.0. In developing this sampling procedure, each subinterval was given a width of .5 rather than .1 (the interval size of data received from HRL). With subintervals of size .1, the frequencies in the subintervals are relatively small which results in more tasks selected than are present in a subinterval, and with an interval size of .5 one is left with 15 to 20 subintervals which is reasonable to justify the adequacy of a frequency distribution in describing the data. Therefore, the job of selecting tasks was simplified with a minimal loss of information.

In developing the sampling scheme, the frequencies of the tasks falling in the subintervals for a particular AFSC were weighted in such a way that proportionately more tasks were selected from the high demand subintervals. Therefore, an exponential sampling scheme was used in which the number of tasks selected from each of the 13 ranges utilized an exponential weighting scheme symbolized by $W_1 = \exp(2.5)$, $W_2 = \exp(3.0)$, ..., $W_{13} = \exp(8.5)$. The number of tasks selected from the i-th range was

$$n_i = \frac{f_i w_i}{\sum_{i=1}^{13} f_i w_i} \, n, \qquad i = 1, 2, \ldots, 13,$$

where n was the number of tasks to be selected and f_i was the number of tasks available in the i-th range.

The use of exponential weights assured the selection of more tasks from the heavy side of the demand scale. Using these exponential weights, however, sometimes resulted in larger sample sizes than the actual number of tasks available in some of the subintervals. For example, there may be only four tasks available for selection, but this sampling scheme may require 10 tasks to be selected. This variance also existed when linear weights were used, but to a lesser degree. When this occurred, a "roll-down" procedure was used, that is, all four available tasks from the subinterval were picked and the

remaining six from the next lower subinterval under consideration were selected.

Table 5 illustrates this situation. In this example, the intervals 7.0-7.5, 7.5-8.0, 8.0-8.5, and 8.5-9.0 had no tasks available. The use of exponential weights required more tasks to be selected than were present in the subintervals 6.0-6.5, and 6.5-7.0. Therefore, using the "roll-down" would require additional tasks to be selected from lower ranges.

Administration of Questionnaire 2

Administration of Questionnaire 2 was also conducted by AFHRL. Basic procedures and the "wave" concept used for Questionnaire 1 were used. The 25 (or 50 in the case six AFSCs) tasks for the TTU section were supplied by TTU to AFHRL based on Questionnaire 1 results. These tasks became a subset of the 60-100 tasks used by AFHRL in their section of the survey.

Questionnaire 2 was designed to be administered to approximately 50 (or 100 for the six test AFSCs) supervisors in each AFSC. To keep administration time to less than three hours, and because the HRL section of the questionnaire required each supervisor to respond to approximately 60-100 tasks, HRL imposed a limit of 10 tasks per supervisor for the section developed by TTU. (For a total of 10 task x 50 rater = 500 Task-Raters.) In order to provide an adequate demand representation for each AFSC for TTU, it was necessary to obtain a total of 25 tasks for each AFSC. Therefore each supervisor was not given the same 10 tasks in section III. Instead, each supervisor was given a select set of 10 tasks which differed from those provided to other supervisors. Thus for purposes of reliability, the tasks given to each supervisor were arranged to obtain data for a total of 25 tasks with approximatley 20 supervisors responding to each task. (500 Task-Raters ÷ 25 Tasks = 20 Raters/Task.)

Analysis of Questionnaire 2

In November of 1979, AFHRL conducted a pilot study of Questionnaire 2 using 40 supervisors (10 each in 4 AFSCs) with 27 returns. During December, a brief review of the 27 booklets returned was made by two of the TTU team members. When they compared task responses in the TTU sections, with the same tasks in the AFHRL section, they frequently found no apparent relationship between them. For instance, in the HRL lifting activity might be given a strength rating of 8 or 9 indicating a very large physical demand while the same task in the TTU section would be marked with no or very light demands for lifting. Also noted was a tendency for the supervisor to start using identical ratings for both the strength and endurance scales of the HRL section

TABLE 5

EXAMPLE OF TASKS SAMPLING USING EXPONENTIAL WEIGHTING SCHEME AND ROLL-DOWN PROCEDURE (AFSC 431X0)

Range	$\frac{w_i}{\sum w_i}$	n_i	f_i	n_a
5.5-6.0	.401	10	5	5
5.0-5.5	.243	6	15	11 (6+5)
4.5-5.0	.147	4	22	4
4.0-4.5	.089	2	36	2
3.5-4.0	.054	1	37	1
3.0-3.5	.033	1	69	1
2.5-3.0	.020	1	110	1
2.0-2.5	.012	0	146	0
	1.000	25	440	25

where:

w_i = exponential weights

f_i = number of tasks available for selection

n_i = number of tasks to be selected using exponential weights

n_a = number of tasks selected using roll-down procedure (tasks not available for selection in one range are taken from next possible range)

part way through their responses to the 100 tasks in that section. Table 6 shows the correlation coefficients between strength ratings for both sections.

Subsequent Analysis

A later comparison of the AFHRL and TTU sections was made when more returns from Questionnaire 2 were available. For this analysis, fewer AFSCs were selected but the sample size in each was increased. The AFSCs used and the corresponding sample sizes, N, were:

AFSC	N
304x4 Ground Radio Comm.	23
321X0 Bomb-Nav. Systems	25
431X1/431X2 Aircraft Maintenance	17
571X0 Fire Protection	57

Selection of the above AFSCs was based on the nature of each. Aircraft Maintenance was known to be very complex, involving several types of aircraft, and comprised of many "separate" AFSC's. Depending on the aircraft handled, each AFSC (shredout) required different job demands. Bomb-Nav. Systems and Ground Radio Communications were considered "straight-forward" AFSC's with specifically defined activities and objects. Fire Protection was chosen for its "uniqueness" because of the job demands required of firemen. As a result, this AFSC required specific tasks dissimilar to most other AFSC's.

Because of the design of questionnaire 2, the Spearman correlation was used to investigate in general the differences between the two sections of the survey. Table 7 shows in the summary of the correlation coefficients. The values in Table 7 indicated a general tendency of low to moderate correlation between the responses of the AFHRL and TTU sections of the survey. Bomb-Nav. Systems appeared to reflect the greatest correlation between the two sections compared to the other AFSCs. The lowest correlations corresponded to activities in Aircraft Maintenance. These results held fast to the assumptions made on the nature of the AFSCs chosen - higher correlations for a well defined AFSC, such as Bomb - Nav. Systems opposed to the more complex job demands of Aircraft Maintenance.

Based on the results of questionnaire 2, it was found that, although the questionnaire concept would be most economical, it did not yield the anticipated results. The results showed pattern marking of answers either due to the survey being lengthy or not taken seriously. It should also be noted, questionnaire 2 was developed before meaningful amounts of field survey data were available for analysis and thus were based on face validity and a prior assumption.

TABLE 6

CORRELATIONS BETWEEN STRENGTH RATING IN SECTION II (AFHRL) AND THE WEIGHT/FORCE VALUE IN SECTION III (TTU) OF QUESTIONNAIRE 2

AFSC	L/L	P/P	C	T	OVERALL
1. Helicopter Maintenance (431x0)	.53	.41	.44	.68	.52
2. Pavement Maintenance (551x0)	.22	-.31	.04	-.32	-.21
3. Pararescue Recovery (115x0)	.10	.03	-.16	N/A*	.01
4. Bomb-Navigation System (321x0)	.32	.67	.27	.89	.53
5. Missile Electronic Equipment Specialist (316x2)	.67	.26	.53	.81	.54
6. Outside Wire and Antenna Maintenance (361x0	.13	.41	.47	.30	.31
7. Missile Systems Cable Splicing & Maintenance (361x1)	.48	.24	.22	.00	.35
8. Aircraft Maintenance (431x1) or (431x2)	.34	.16	.19	.53	.27
9. Electrical Power Line Maintenance (542x1)	.39	.22	.64	.08	.40
10. Vehicle Maintenance (472x2)	-.16	-.06	.00	.01	-.04
11. Survival Specialist (921x0)	.29	-.21	.18	N/A*	.14
12. Security and Military Working Dog Qualified (811x2A)	-.31	.16	.31	N/A*	.20
13. Fire Protection (571x0)	.51	.49	.38	.35	.46
14. Meat Cutter (612x0)	.65	.50	.52	-.43	.52
15. Fuel Services (631x0	.31	.05	.30	.06	.18
16. Security Police (811x0) or (811x2)	.73	.07	.03	N/A*	.11

*Not applicable as the data were not available.

Key: LL = Lift/Lower activity
PP = Push/Pull activity
C = Carry activity
T = Torque activity

TABLE 7

SPEARMAN CORRELATION COEFFICIENTS FOR TTU AND AFHRL QUESTIONNAIRE DATA

AFSC	LIFT	CARRY	PUSH/PULL
304X4	0.56	0.45	0.34
321X0	0.43	0.45	0.57
431X1/431X2	0.33	0.27	0.23
571X0	0.47	0.42	0.38
All AFSCs Combined	0.46	0.40	0.38

DATA COLLECTION BY INTERVIEW/VERIFICATION TECHNIQUES

Because of problems in consistency between the two sections of questionnaire 2 plans were made to initiate base visits to collect the needed data in place of questionnaire 2. An interview format was developed to obtain estimates of the weights and forces encountered when performing the 25 tasks selected for Questionnaire 2. The interview was followed by a visit to the workplace where as many actual weights and forces as possible were measured for these tasks or other demanding tasks identified by the supervisor.

Development of Interview Techniques

During the development of Questionnaire 2, long range plans were made for field validation of the data obtained by the survey. The field work was intended to be done on a limited, but representative scale, compared to the survey questionnaire. The data obtained from the field validation were originally intended to be used to "adjust" the questionnaire results. It was originally intended to conduct the field studies after receiving the data from each wave of Questionnaire 2. However, with the delays encountered in getting Questionnaire 2 into the field, it was decided to start field validation work earlier, resulting in the field validation running concurrently with the questionnaire.

The field validations were developed around a two-stage format: a) an interview and b) a verification of data in the work areas. The interviews were to be conducted using the tasks selected for Questionnaire 2 as a guide so that comparable data could be obtained. The interviews were planned to last no more than 1-1/2 hours, preferably 50 minutes on the average. The verification step consisted of obtaining actual measures of the task demands, especially in terms of the weights and forces required.

Some preliminary analyses were performed on interview data that were obtained prior to the summer of 1980. The supervisors gave estimates of the weights (or forces) required for Lift/Lower (LL), Push/Pull (PP), and Carry (C) activities relevant to various tasks in their AFSC's. The actual weights (or forces) required to perform the activities were then measured (verified). The following Pearson correlation coefficients between the estimates and the actual values were obtained, where N represents the number of pairs of estimates and actual values and R represents the correlation coefficient:

LL, N = 448, R = 0.814
PP, N = 121, R = 0.488
C, N = 183, R = 0.882.

The value for N does not represent the number of supervisors, but the number of estimates and actual values. That is, each supervisor could

have given one or more estimates. The smaller value of R for PP could be due to the fact that it is not as easy to give an estimate for a PP activity as it is for an LL or C activity.

The format for the interview consisted of four steps. A brief description of the project and its objectives was first given to each supervisor. Next, standardized background information on the supervisor was collected. The more "formal" part of the interview was initiated by asking the supervisor to rank the task list for his AFSC in order from the most to the least physically demanding. The 25 tasks were coded with the letters A through Y. Examples of the instructions and a task list are shown in Tables 8 and 9 respectively. The supervisor's rank order was then transferred to the principal interview sheet and used to set the general pattern for the remaining part of the interview.

The front of the interview sheet (Figure 5) was organized around the manual material handling activities used in the development of questionnaire 2. Therefore the primary catagories were lift/lower, carry, push/pull, and torque. However, a column was provided to obtain additional information on other demanding activities. The activities were coded as shown in Table 10.

The interview format originally developed was designed to quickly survey the task list to determine the number of demanding activities in each catagory. The supervisor was asked to identify which demanding activities were found in each task. These were indicated by a mark in the upper left small box in the appropriate activity columns. After surveying all tasks, the marks in each column were to be totaled. The interviewer would then go back through the list concentrating on just the predominate activities. For these, he would ask for an estimate of the weight or force involved which was recorded in the large square and the usual posture involved which was recorded in the lower smaller square using a number code (Table 10). A space was provided for general remarks specific to each task. In addition, a column was provided to assess the general strength and/or endurance requirement of the entire task. The supervisor was asked if it was more important for an individual to have strength or endurance to be successful in that task.

The back of the interview sheet (Figure 6) was originally designed for use with the verification step following the interview and to record the supervisor's comments. It was planned to select 5 representative tasks from the list of 25. For these five, an attempt was to be made to measure the actual weight or forces that the supervisor had estimated. To do this, the field team was equiped with Amtek load cells (Model CT-1000) and digital display units (Model HSC-11), and was able to obtain actual weights and forces associated with tasks in the work area.

TABLE 8

INSTRUCTION SHEET FOR TASK RANKING USED
DURING FIELD INTERVIEWS

INSTRUCTIONS FOR RANKING TASKS ON TASK LIST

You are asked to rank a list of 25 representative tasks performed in your AFSC. When comparing one task against another, consider only the physical demand required to perform each task-not how frequently, or infrequently, you may perform each task.

Physical demand includes both strength and endurance. Strength and endurance are found in tasks which include heavy muscular demand, or frequent and continuous exertion of muscular effort. For example, in one task you might lift a heavy weight once. In another, the weight might be considered light if lifted only once, but the task requires many repetitive lifts. The first example requires strength, and the second, endurance; but both are physically demanding tasks.

Rank the 25 tasks in order from 1 to 25, according to the physical demand required to perform each task. The task you rank number 1 should be the most physically demanding task on the list. Number 25 is the least demanding.

If you have not performed a task and cannot rank it, mark it NA (Not Applicable) and proceed to rank the remaining tasks.

If you have performed a task(s) that is <u>not</u> on the list but is significantly demanding (i.e., it ranks with the top five tasks you have ranked), then inform the interviewer in the discussion which follows.

Note: Security classification of this interview is "Unclassified"

TABLE 9

EXAMPLE OF AFSC TASK LIST USED DURING FIELD INTERVIEWS

TASK SHEET		AFSC 304X4 Ground Radio Equipment and Repair	K-009
TASK	RANK	TASK DESCRIPTION	
A		Remove or install power supply systems (F 193)	
B		Remove or install permanent type antenna sys. (F191)	
C		Remove or install multiple channel HR power amplifiers (F 167)	
D		Remove or install consoles other than Launch control consoles (F 189)	
E		Remove or install single channel SSB power amplifiers (F 220)	
F		Set up mobile communications vans for use (F 245)	
G		Remove or install multiple channel HF transmitters (F 170)	
H		Remove or install multiple channel or track recorder and reporducers (F 176)	
I		Remove or install multiple channel UHF transmitters (F 181)	
J		Remove or install multiple channel UHF power amplifiers (F 178)	
K		Dig trenches (L 662)	
L		Remove or install UHF transmitters (F 235)	
M		Set up tents or 1948 shelters (L 672)	
N		Remove or install multiple channel UHF receivers (F 180)	
O		Remove or install UHF transceivers (F 234)	
P		Lay electrical or communications cables (L 664)	
Q		Set up bath, kitchen door sanitation facilities (L 669)	
R		Remove or install multiple channel HF transceivers (F 169)	
S		Remove or install UHF Linear power amplifiers(F232)	
T		Remove or install multiple HF receivers (F 168)	
U		Remove or install Hacsimile systems (F 168)	
V		Remove or installmultiple channel UHF exciters (F 177)	
W		Deliver test equipment to materials control or PMEL (E 113)	
X		Remove or install mobile antenna systems (F 165)	
Y		Remove or install single channel SSB transceivers (F 222)	

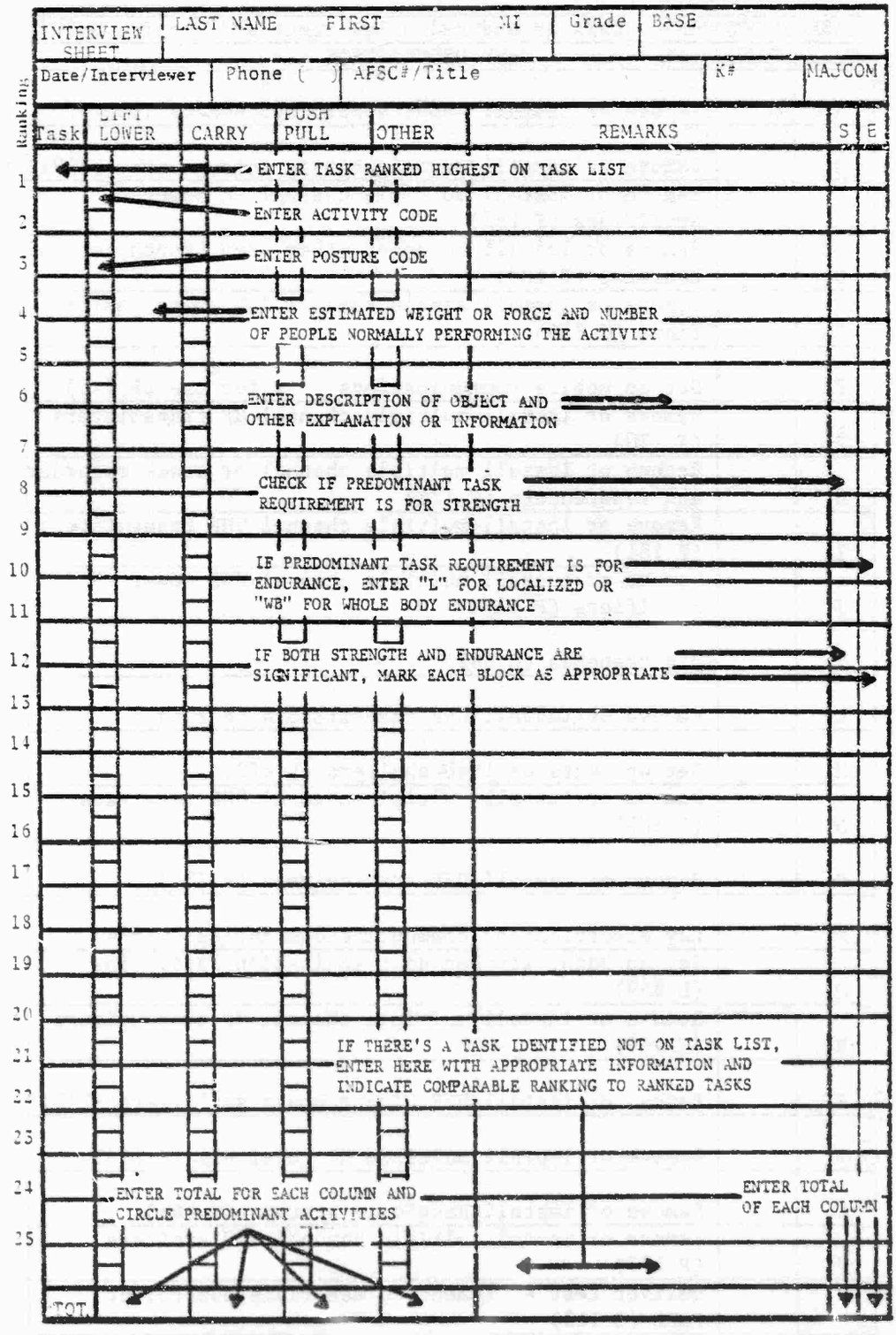


Figure 5. Front of Interview Sheet Used During Field Interviews

TABLE 10

CODING SHEET USED TO IDENTIFY ACTIVITIES
AND POSTURES ON INTERVIEW SHEET

EXAMPLES OF ACTIVITIES

A Lift	F Torque/turn
B Lower	G Hold/position
C Carry	H Climb
D Push	I Shovel/dig
E Pull	J Hammer

0 Other--as appropriate for your AFSC

WORKING POSTURES

1 Standing	6 Kneeling
2 Walking	7 Lying
3 Running	8 Stooping (knees bent)
4 Crawling	9 Bent at waist
5 Sitting	10 Other

		Actual		VERIFICATION DATA			
TASK	ACTIVITY	WEIGHT OR FORCE	POS.	OBJECT	REMARKS	S	E

General Comments:

1) Number of year's experience in the AFSC
2) Identify point of contact for verification within the work area and coordinate scheduled appointment

Ask for comments on the following:

1) Supervisor's suggestion/recommendation for what to test to measure physical requirements within the AFSC
2) Supervisor's experience with females and weaker males working in the AFSC
3) Supervisor's identification of the most critical task(s) for performance within the AFSC
4) Other: Training School requirements, climatic impacts, geographical factors, work schedule problems, etc.

Figure 6. Back of Interview Sheet Used During Field Interviews

Testing and Finalization of Interview/Verification Procedures

After development of these interview procedures, several interviews were arranged at Reese AFB, Hurlwood, TX. These involved the following AFSCs: Fire Protection, Pavement Maintenance, and Aircraft Maintenance. In the course of these interviews, it rapidly became evident that the initial assessment of which demanding activities were present and tallying their numbers was unnecessary. Going through the task list twice during the interview (not counting the airman's ranking step) required the individual to recall what specific aspect of the task he originally had in mind when later asked to detail these demanding activities. The airmen were usually verbally identifying a specific object and associated activity the first time through the list. Therefore it was actually more expedient just to ask what was the most demanding lift/lower, for example, determine what object was handled, and to get an estimate of the weight involved and the required posture when going through the list the first time. After the first few trips, the decision was made to record the height range involved for lift/lower activities. These were coded to indicate the starting and ending points using F for floor, P for pallet, K for knuckle, W for waist or workbench, S for shoulder, and R for reach.

It also became obvious during these initial interviews that the number of people involved in performing an activity had to be recorded since two or more people frequently participated in the activity. Thus the number of people, if more than 1, was indicated under the estimated weight by "2 p", etc. If the weight was large but still handled only by one individual, this was specifically noted as "1 p" to avoid later confusion.

During these interviews some problem also arose with the strength/endurance columns. Although the endurance column was originally intended to note cardiovascular endurance, many individuals wanted to express a requirement of the task for localized endurance. Therefore responses in the endurance column were coded "WB" or "L" to distinguish between "whole-body" (cardiovascular) endurance and "localized" muscle fatigue (as from hammering). Individuals were encouraged to choose either strength or endurance but if they insisted that both were equal, that was recorded.

Originally the interviews followed by the verification were conducted at the airman's work place. This often led to numerous interruptions and distractions making it difficult to complete the interview in 1-1/2 hours. During a trip to Wright-Patterson to show the interview format to the technical monitor, the airmen were asked to come to his office for the interviews. This proved to be a superior technique as the individual could devote his entire attention to the interview. During the interview, arrangements were made for the field team to go to the interviewer's work place at a later time

for verifications. When possible, a definite appointment was set up. Otherwise, arrangements were made to call the airman prior to meeting with him.

When attempting to verify the five tasks selected from the interview, it was frequently impossible to find all the necessary items at the work site specific to those tasks. All available items were weighed along with any other items the supervisor would regard as highly demanding. Measurement of push/pull forces and torques were much more difficult. These frequently required that the task be ongoing. Wherever possible that portion of the task was "set up" and the forces measured.

Improvements in the verification stage were accomplished by the development of a worksheet (Figure 7). Before going to the shop, the items mentioned during the interview were transferred to this sheet along with the activity and estimate. When the object was weighed or a force measured, the actual weight/force was recorded in the appropriate column. Thus on later visits to a shop, it was readily apparent what verifications had or had not been made. The sheet was also used during subsequent interviews. After finishing the regular interview, the airman was asked for estimates on any of the worksheet items that he had not mentioned.

After enough interview/verification data had been collected to develop simulated tasks (described later), the interview sheet was modified again to provide space for coding which simulated task best described the activity involved. At the same time, space was also provided on the interview sheet to record the supervisor's estimates of the percent of first and second term airmen who performed each task and an indication of how frequently (daily, weekly, monthly, quarterly, semi-annually, or yearly or more) the task was performed. The space for recording information on each activity was enlarged so that the interview "sheet" covered two pages on both sides. Space was provided on the last sheet for summarizing the number of activities identified and for recording additional remarks. The revised interview sheet is illustrated in Figures 8 and 9.

At the same time, the work sheet was revised to allow space for entry of the simulated task code, percent participation,and task frequency (Figure 10). The order of the columns were also rearranged to facilitate data entry into the computer.

Planning and Scheduling of Base Visits

Utilizing a variety of data available within the Air Force personnel system, such as preliminary strength and stamina surveys, percent participation of airmen performing tasks with each AFSC, and other general information pertaining to the organizational units and weapon

WORKSHEET K#009 AFSC#304X4

AFSC TITLE: GROUND RADIO EQUIPMENT & REPAIR SAMPLE

TASK	OBJECT	POSTURE	ACTIVITY	ACTUAL (WT. OR FORCE)	ESTIMATED (WT. OR FORCE) S1 TSG LEE CARSWELL SAC	S2 TSG MORE Ellsworth SAC	S3 SSG SMITH SCOTTY MAC	S4	S5	OTHERS
H	AN/GSH-34 Multiple Channel Tape Recorder	9	Lift (FK)	425/4P = 106	200/3P = 50	300/3P = 100	100/3P = 33			350/4P = 88
H	" " " (4P push along smooth floor)	9	Push		350/4P = 88					
H	AN/GSH-36 Tape Recorder	9 2	Lift (FK) Carry	44½		40	35			50
H	TP-1510 Tape Player	9 2	Lift (FK) Carry	130/2P = 65		150/2P = 75	75/2P = 38			120/2P = 60
H	AN/GSH-35 Tape Recorder	9 2	Lift (FK) Carry	325/4P = 81		200/4P = 50	150/4P = 38			300/4P = 75
M	6-Man Tent, Bundle (tent, spikes, rope, etc.)	9 2/1	Lift (FK) Carry	156/2P = 78	200/2P = 100	180/2P = 90				
M	1948 Shelter Box of Equip. (floor, ropes, supports, etc.)	9 2/1	Lift (FK) Carry		400/6P = 67	300/3P = 100				
P	487L Cable (100' length)	9	Pull	86	75	90				
L	UHF Transmitter (2 sections)	1 1,2	Lower (KF) Carry	30	50	40				
V	T-1108 Multiple Channel UHF Exciter	1 ½	Lower (KF) Carry	43	60	100	40			
W	200 CD Audio Oscillator	9	Lift (FK)	21	30	12	10			
W	323 Signal Generator	9	Lift (FK)	62	40	40	50			
Y	6182 Single Side Band Transceiver	9	Lift (FK)	29	25	30				
T	Multiple Channel HF Receiver	9/1 ½	Lift (FK) Carry	66	60	65				
RE	FRC-153 Multiple Channel HF Transceiver	9/1 ½	Lift (FK) Carry	30	60	70				
S	AM-6154 UHF Linear Power Amplifier	1/9 ½	Lower (KF) Carry	70	40	55	62/2P = 31			

Figure 7. Work Sheet Developed for Use During Field Verification

Form Apvd.
3/2/81

INTERVIEW SHEET	LAST NAME	FIRST	MI	GRADE	BASE	TRIP #	MAJCOM	SUPV #
K #	AFSC #/TITLE	YRS. EXP.	PHONE ( )	DATE	INTERVIEWER	X-FACTOR		

TOP 5 RANKED TASKS

RANK	TASK	ACTIVITY	OBJECT	POSTURE	STMUL. TASK	COMMENTS	ESTIMATE WT/#P = SHARE	FREQ.	% PART.	STRENGTH	ENDUR.
1											
2											
3											
4											
5											

Figure 8. Revised Interview Form: First Page

RANK	TASK	ACTIVITY	OBJECT	POSTURE	SIMUL. TASK	COMMENTS	ESTIMATE WT/#P = SHARE	FREQ.	% PART	STRENGTH	ENDUR.
22											
23											
24											
25											
Z											

TOTALS:

LIFT/LOWER(LXX)___
CARRY(CAR) ___
PUSH/PULL(P/P) ___

ACTIVITIES

TORQUE/TURN(T/T) ___
HOLD/POSITION(HPX)___
CLIMB(CLI) ___
SHOVEL/DIG(S/D)___
HAMMER(HAM) ___

STRENGTH/STAMINA

STRENGTH(S) ___
ENDURANCE(E)___

REMARKS:

VERIFICATION: Building_____ Contact_____ Telephone_____ Day/Time_____

Figure 9. Revised Interview Form: Last Page

Form Apvd.
3/2/81

WORKSHEET	K	AFSC	TITLE	Page ___ of ___

TASK	ACTIVITY	OBJECT	POSTURE	SIMUL. TASK	FREQ	% PART	ACTUAL	ESTIMATE S1	S2	S3	S4	S5

Figure 10. Revised Worksheet for Field Verification and Data Entry

systems located at each of the Air Force bases, an initial plan was developed to ensure proper selection of the bases and AFSCs for the reviews. This resulted in achieveing the established objectives for the stratification of mission performance by major air commands, and variances in job requirements due to geographical factors and weapon systems.

The current "Airman Classification Structure Chart" (used in conjunction with AFR 39-1) served as the project baseline for the total population of AFSCs to be quantified for physical demands. The 31 October 1981 structure chart listed a total of 226 AFSCs and 188 separately identifiable shredouts, plus an additional 30 "Special Identifier" AFSC's for an overall total of 434 AFSCs/Shredouts. Of this amount, approximately 20% were classified as Factor-X three AFSCs (i.e., basically administrative jobs requiring a low level of physical demands). The remaining 80% of the AFSCs, then, were all primary candidates for the verification review process. A priority approach was taken to evaluate Factor-X one AFSCs first and then, the lesser demanding Factor-X two and three AFSCs.

A variety of criteria were used in the process of developing the approach for selecting 10 Air Force Bases to be used for the field validations. For example, the "civil engineering" family of six AFSCs was scheduled at bases ranging in size from a small ATC base with limited personnel, minimum essential support and handling equipment, to the largest civil engineering operation in the Air Force at a base with several hundred personnel performing the spectrum of required jobs with a variety of material handling equipment. Another special family of functionally homogenous AFSCs belonged to the missile weapon system career fields. The three bases chosen not only provided the data and capability to evaluate the functional differences in the jobs (i.e., missile mechanic, missile facilities, missile equipment, etc.) but also the variances in the performance of each job in terms of specific weapon systems. The data collected can also be segregated by the two major missile systems (Minutemen Missile and Titan Missile) and by operational mission performance, or by special missile training and testing mission requirements.

Due to the large number of Air Force personnel utilized within the Aircraft Maintenance career fields (AFSCs 431X0, 431X1, and 431X2), data collection and segregation capability existed for not only evaluating the jobs by light, tactical aircraft and heavy aircraft categories, but also by each of the major aircraft shredouts within each category. This approach in developing the field validation plan and schedule provided early visibility into the differences between the physical demands of each category. Some tasks were more demanding when performed on heavy aircraft (bombers and transports); others were more demanding when working on light, tactical aircraft. Variances existed even within the same category; i.e., accessibility to equipment

on the latest F-15 or F-16 fighter aircraft was easier than with other "light" aircraft, reflecting fundamental design concepts incorporated into the engineering and development of these newer, more advanced technology weapon systems. Furthermore, some aircraft mechanics are utilized in other related jobs (Aerospace Repair Shop, Engine Depot Maintenance, etc.) sometime in their career progression which, in turn, creates additional variances in physical demands.

A similar approach was taken in selecting bases and collecting data for other career fields typified by the electronics and avionics AFSCs. In addition, consideration was also given to geographical and climatic factors in selection of the bases. Lastly, it was considered especially important to have a balanced stratification of interviews by major Air Force commands in evaluating the difference in requirements due to mission performance responsibilities by each major air command.

Having evaluated the above factors and finalized selection of bases to visit, the next step was to determine the number of interviews to be conducted at each base and to identify the tasks within any AFSC where primary stress would be placed in accomplishing the verification of data in the workplace environment. The initial target objective was to strive for an average of three interviews for each of the AFSCs reviewed. Primary emphasis would then be placed on the "top 5" tasks ranked by each supervisor interviewed. This would produce a possible range of 5-15 tasks to be verified for the predominent action in each of the 21 career fields. Recognizing that it would not always be possible to find all the objects handled or equipment used readily available in the work areas for measurement, the team targeted its planning objective for verifying three of the five top ranked tasks identified by each supervisor interviewed. Where it was impractical to measure the weight or force applied to an object or piece of equipment, the team members investigated the existence of official documentation, such as Tech Order publications, to obtain the data. This source of data proved to be a valuable supplement to the collection of verified data, especially in such career fields as aircraft maintenance, avionics, loadmaster, egress systems, radio equipment, etc., where technical manuals used frequently in the performance of the job were readily available and contained weight data by specific weapon systems.

Additional information and data were collected during surveys of the supervisor's work area and in discussions with other personnel (i.e. working associates, subordinates, and/or superiors of the supervisor interviewed). Typical information included scenarios on the work schedule and working environment, material handling equipment available, unique mission requirements, adverse climatic and working conditions, participation on special missions and/or exercises, comments from first-term airmen and females working in the AFSC, and

other pertinent information. To a limited degree, photographs were taken of the worker performing a physically demanding task in an unusual position, a confined work space, and/or handling a heavy object or piece of equipment. When available, technical publication libraries were researched for pertinent data, with the assistance of authorized, assigned personnel. Very valuable sources of information and expertise were the functional experts at major air command headquarters; for example, the Loadmaster NCOIC for each of the mission aircraft assigned to Headquarters MAC, the Life Support Equipment NCOIC at the same command headquarters, and the Minuteman and Titan missile system evaluation teams at Vandenberg, AFB provided invaluable assessments of job requirements and personnel performing within their career field throughout the command.

Official coordination, clearances, and detailed schedules for each base visit were handled by a designated official from the program technical monitor's office (AFAMRL). This timely and thoughtful support was invaluable to the team, making the performance of their job easier and more efficient. Proper clearances and approval for the visits were first obtained through each of the major air command headquarters. Thereafter, each base visit was arranged for by a request letter to the base commander's office followed by an approval response. Detailed arrangements were then coordinated with the designated point of contact, a CBPO (Consolidated Base Personnel Office) representative, at least three weeks in advance of the planned visit. Follow-up coordination was accomplished normally one week before arriving on a base visit. Without exception, all base visits were completed smoothly thanks primarily to the professional competency of the personnel who handled the administrative details for scheduling the interviews, reserving excellent facilties for conducting the interviews, and properly notifying concerned participants and their supervisors. The team received a warm welcome and total support for their activity at each and every base they visited. This was especially gratifying and recognized in personal letters of thanks to those responsible for providing this essential support.

As mentioned previously, interview and verification procedures were constantly being refined and improved with each of the early visits to bases. Time saving techniques were integrated with improved data collection procedures to produce a more efficient and effective operation by the team. Almost imperceptibly at first, the team was able to increase the number of interviews conducted while concurrently obtaining more comprehensive data on each interview and verification review. The advantages of on-site personal interviews with experienced supervisors was readily apparent. All of these factors, combined with the addition of two more team members and additional measuring equipment, resulted in a reorientation of the team's objective from one of gathering verified data for the ultimate purpose of correlating it to Questionnaire 2 responses to one of actually verifying the physical demands of the AFSCs.

Appendix D presents a summary of the actual bases visited, the number of interviews conducted, and the number of AFSCs reviewed. The corresponding total number of supervisors interviewed is 885. These totals constitute an increase of almost 300% in the number of orignially planned interviews and a 100% increase in the number of AFSCs to be reviewed.

Table 11 contains a summary breakdown of the number of supervisors interviewed by grade and major air command assignment. The grade distribution indicates a desirable spread rather than an overloading in the lower grades of less experienced airmen. The average total years of experience within the AFSC career field was almost 10 1/2 years.

Table 11 also reflects a representative distribution by major air command of assignment. As expected, the predominent command of assignment is the Strategic Air Command (SAC). This can be partically attributed to the fact that eight of the AFSCs are in the "missile family" of jobs related to the Titan and Minuteman weapon systems; both of these strategic weapon systems come under this operational control and responsibility of SAC. To a lesser degree, the aircraft maintenance, bomb-navigation systems electronic warfare systems, and "avionics" AFSCs contribute substantially to the total of 885 supervisors interviewed.

The average grade of E-6, Tech Sergeant, coincides with the targeted grade established at the outset of the project. The average years of experience working in the AFSC (10 1/2 years) is a good indicator of the total experience possessed by the personnel interviewed. In addition, a representative stratification of major command of assignment was obtained and was most beneficial in the analysis of the data collected, especially in terms of variance in mission performance and weapon systems involved.

Interview/Verification Data Handling Procedures

After each base visit, the data collected were tabulated on the worksheets. When several interviews had been completed in an AFSC, the data were reviewed for completeness. When a judgement was made that sufficient data had been obtained for an AFSC it was declared "closed" and, in most cases, no further interviews were conducted. The rationale for closing an AFSC was based on the number of interviews conducted, the number of actual weights/forces measured, the number of estimates, and the likelihood of obtaining an actual value with which to replace the estimate. The closeout decisions were made by a retired USAF Colonel who also used his service experience in making this judgement.

Each AFSC was submitted to an audit when it was closed out. In this process a master worksheet was prepared with tasks alphabetized.

TABLE 11

SUPERVISORS INTERVIEWED (BY GRADE & MAJCOM)

SUPERVISORS INTERVIEWED (BY GRADE & MAJCOM)

Grade	SAC	MAC	TAC	AFLC	AFSC	ATC	OTHER	TOTAL
CMS (E-9)	1	10	1	-	-	1	1	14
SMS (E-8)	6	16	6	1	-	1	3	33
MSG (E-7)	37	37	40	15	6	14	22	171
TSGT (E-6)	97	57	67	12	10	16	37	296
Lower (E-5, 4,3,2,1)	55	53	78	24	8	6	39	263
Other (2Lt & civilian)	20	22	31	9	1	13	8	104
	3	-	-	-	-	1	-	4
Totals	219	195	223	61	25	52	110	885

Average Grade: TSG (E-6)

Average Number of years of experience, 10 1/2 years, per supervisor.

This master worksheet was reconciled to all interview sheets and other supporting information to make sure that it contained all relevant data. Data on top rank tasks, number of tasks requiring lifting, carrying, etc. and other summary statistics were posted on an AFSC summary sheet (Figure 11).

The master worksheet was then used to input data into the computerized data file. A copy of the file structure and layout is shown in Table 12. In addition, a sample printout of the file contents is given in Figure 12. If additional actual values became available after data entry, the computer files were updated as appropriate.

Analysis of Interview/Verification Data

Descriptive statistics in terms of means, standard deviations and ranges of weights or forces by activity were obtained for each AFSC. Histograms of task demands by activity for each AFSC or for the combined AFSCs were also prepared.

The predominant activity for most AFSCs was lift/lower followed by push/pull.

K____ AFSC: _____ Title: _____

S#	Top-5 Ranking Order 5	4	3	2	1	Activities Count L/L	CAR	P/P	H/P	T/T	CLI	S/D	HAM	End.
S1														
S2														
S3														
S4														
S5														
S6														
S7														
S8														
S9														
S10														
S11														
S12														
S13														
S14														
S15														
Totals														

Weighted Order of Top - 5 Ranked Tasks														
1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th

Task Coverage		
Act.		
Est.		
None		

AFSC SUMMARY

Worksheets completed
by: _____
on: _____

Worksheets submitted
for computer input
on: _____

Worksheets updated
on: _____

Remarks:

Current Factor 'X'..... _____

Total # of Supervisors.... _____

Tasks Measured
Actuals..... _____
Estimates..... _____
Total..... _____

Activities
Primary..... _____
Secondary..... _____
Tertiary..... _____

Endurance
Average #..... _____
Yes/No..... _____

Strength Index(s_x)..... _____

Figure 11. Example of AFSC Summary Sheet

TABLE 12

STRUCTURE OF INTERVIEW/VERIFICATION DATA FILE

Field	Contents
1-4	K-NUMBER
6-11	AFSC
13-14	TASK
16-18	Activity/Range (Coded)
20-53	OBJECT
55-56	Simulated Task (Coded)
58-60	Actual Force or Weight/Person
62-64	Estimated Force/Person
71-73	AFSC Line No.
75-77	Percent Participation
79	Frequency
80	Number of People Performing

```
001 811X0   A P/P OFFENDER                          P1  55                    1  33 D
001 811X0   A P/P OFFENDER                          **  55                    2  33 D
001 811X0   B S/D SNOW                              **                        3  13 M
001 811X0   C CAR CRASH BOX 1.5'*2'*4'              C4          25            4   9 W2
001 811X0   C CAR 200' SPOOL OF ROPE (.5"NYLON)     C4  51                    5   9 W
001 811X0   C CAR SAND BAG                          C4  50                    6   9 W
001 811X0   C P/P OFFENDER                          P1  55                    7   9 W
001 811X0   C P/P OFFENDER                          **  55                    8   9 W
001 811X0   C LFW SECURITY GEAR (M-16,FLAG VEST)    L7  48                    9   9 W
001 811X0   C CAR SECURITY GEAR (M-16,FLAG VEST)    C6  48                   10   9 W
001 811X0   D CAR CRASH BOX 1.5'*2'*4'              C4          25           11   6 S2
001 811X0   D CAR 200' SPOOL OF ROPE (.5"NYLON)    C4  30                   12   6 S
001 811X0   D CAR SAND BAG                          C4  30                   13   6 S
001 811X0   D LFW SECURITY GEAR (M-16,FLAG VEST)    L7  48                   14   6 S
001 811X0   D CAR SECURITY GEAR (M-16,FLAG VEST)    C6  48                   15   6 S
001 811X0   D CAR XM 33 RIOT CONTROL DISPERSER      C6  21                   16   6 S
001 811X0   E CAR M-60 MACHINE GUN                  C6  23                   17  57 D
001 811X0   E CAR FLACK VEST,GAS MASK,HELMET       C6  18                   18  57 D
001 811X0   E CAR 203 GENERATE LAUNCHER M-16 RADIO C6   9                   19  57 D
001 811X0   E LFW SECURITY GEAR (M-16,FLAG VEST)    L7  48                   20  57 D
001 811X0   E CAR SECURITY GEAR (M-16,FLAG VEST)    C6  48                   21  57 D
001 811X0   F CAR M-60 MACHINE GUN                  C6  23                   22  13 D
001 811X0   F CAR 1500 ROUNDS FOR M-60              C4 119                   23  13 D1
001 811X0   F LFW BOX OF RATIONS                    L7  24                   24  13 D
001 811X0   F CAR BOX OF RATIONS                    C4  24                   25  13 D
001 811X0   F LFW FIELD PACK                       L7  44                   26  13 D
001 811X0   F CAR FIELD PACK                       C4  44                   27  13 D
001 811X0   F LFW MBP GE RADIO                     L7   2                   28  13 D
001 811X0   F CAR MBP GE RADIO                     C4   2                   29  13 D
001 811X0   F LFW M-16                             L7   6                   30  13 D
001 811X0   F CAR M-16                             C4   6                   31  13 D
001 811X0   F CAR M-16,AMO                         C1   8                   32  13 D
001 811X0   G P/P PUSH ON CPR DUMMY                **  75                   33   5 Y
001 811X0   G LFW SECURITY GEAR (M-16,FLAG VEST)    L7  48                   34   5 Y
```

Figure 12. Sample Printout of Interview/Verification Data File Contents

III PHASE II: STRENGTH/STAMINA APTITUDE TESTS

Phase II was concerned with the evaluation of an airman's capacity to safely perform physical work. Two primary efforts were undertaken during this phase of the research project. First, a method of quantifying current AFSC job demands had to be developed. This was accomplished through the development of a series of generic manual materials handling activities called simulated tasks. The second effort was to develop a strength/stamina aptitude test battery that would predict performance on the simulated tasks and consequently could be used to predict success of an airman's ability to safely perform the physical work required by a specific AFSC.

A. DEVELOPMENT OF SIMULATED TASKS

As expected, manual material handling activities accounted for most of the demanding activities identified by Phase I. These activities were subcategorized for performance measures into simulated tasks that were common across AFSCs. Four basic subcategories were used: lift, carry, hold/position and push/pull.

Selection of these simulated tasks were based on the data collected during the first year of field interviews. Since these interviews covered the majority of the most demanding AFSCs, it was felt the collected data were representative of the type of tasks found in all AFSCs regardless of demand level. Interviews were continued, of course, in remaining AFSCs to establish the physical demands for each AFSC since these data were needed for determining the final selection criteria. Once the simulated tasks were established as shown in Figures 13 through 16, the appropriate identification code was noted during an interview instead of posture and descriptive information. Analysis of the data files for the first year interviews revealed that only 6% of the Air Force tasks could not be adequately described by one of the established simulated tasks. In this case, posture/ descriptive notes were taken and an "*" placed in simulated tasks column to flag the special nature of that task). The previously recorded data on posture and task description were used to assign appropriate simulated task codes to interview data already collected.

From the data gathered during the first year of field interviews, frequency distributions were determined for all simulated tasks associated with the AFSC's interviewed. Based on the frequency distributions, the original set of 28 simulated tasks was reduced to a subset of 13 simulated tasks that accounted for approximately 90% of the tasks identified in the first year data base. No simulated task was eliminated from consideration for the final field validation unless it accounted for less than 2% of the simulated tasks in the data file from the first year interviews.

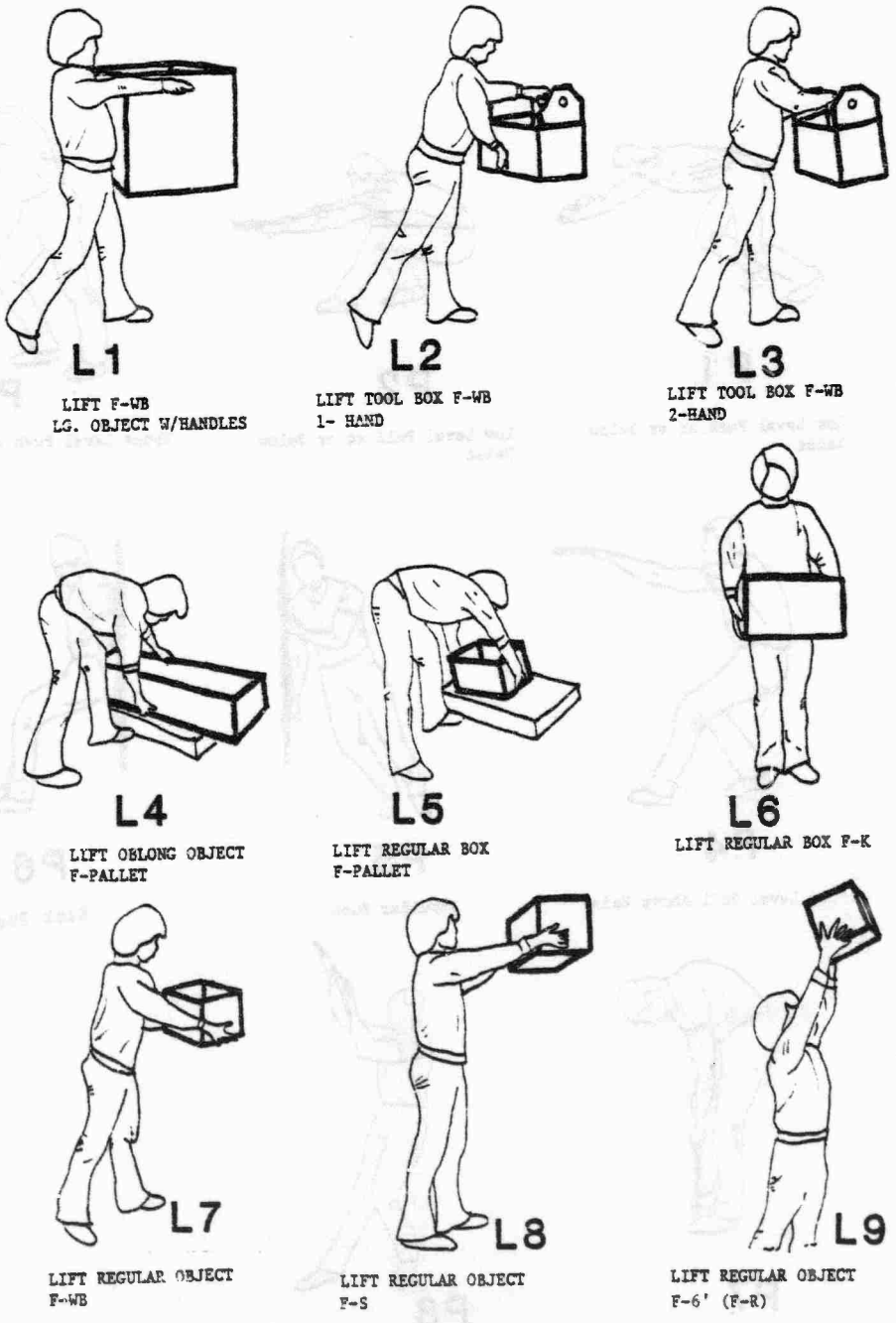


Figure 13. Simulated Tasks for Lift Activities

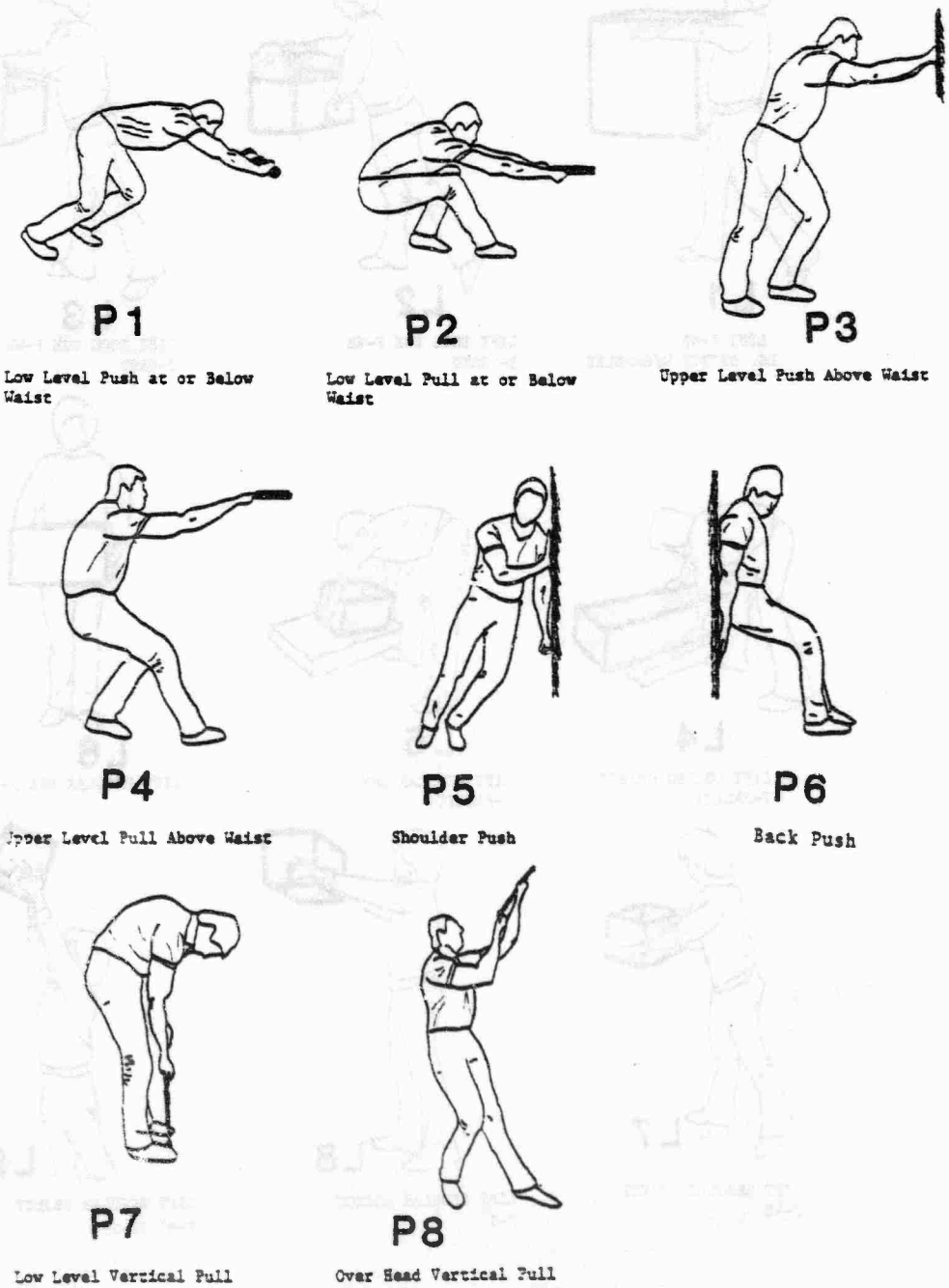


Figure 14. Simulated Tasks for Push/Pull Activities

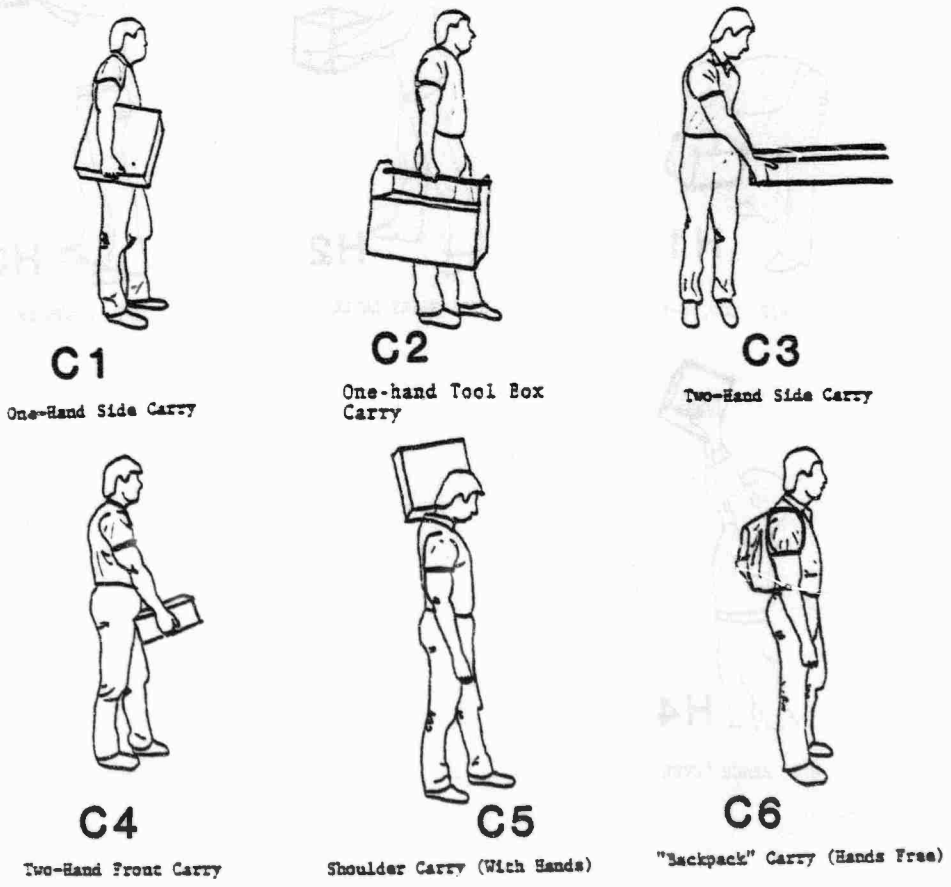


Figure 15. Simulated Tasks for Carry Activities

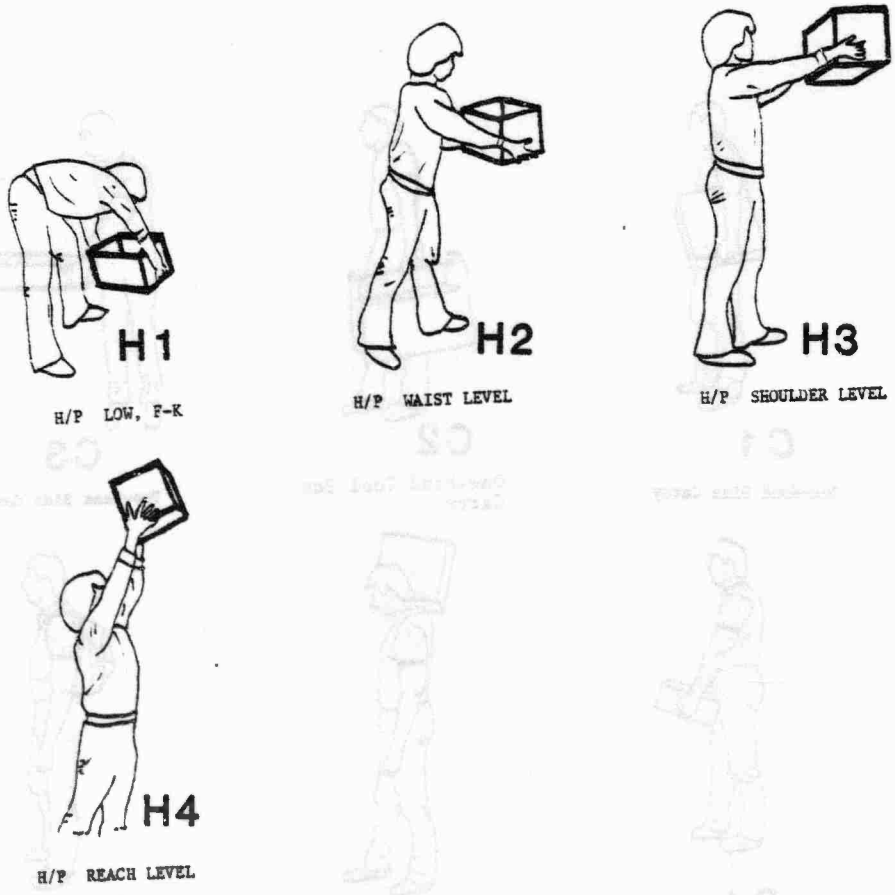


Figure 16. Simulated Tasks for Hold Activities

Performance data in terms of maximum acceptable strength or endurance were obtained for incumbents on a subset of these simulated tasks. Selection of this subset was based on the results of a pilot study, conducted at TTU using students (Smith and Ayoub, 1982). The simulated tasks used for incumbent testing consisted of five lifting tasks, two hold/position tasks, three push/pull tasks, and three carry tasks. The general procedures used when conducting the incumbent testing using these simualted tasks is described below.

Each subject based on a psychophysical method selected his own maximum acceptable weight of load for each of the simulated tasks. Each of the simulated tasks for lift/lower and/or hold/position required that the subject lift a box to a certain height or lift and hold a box at a fixed position. For the lifting tasks the subject was asked to accomplish a completed lift only once. During the hold position tasks, the box was held in position the entire time required by the examiner in order for the task to be considered complete. Each subject was asked to work as hard as he could without becoming unusually tired, weakened, overheated, out of breath, or straining himself in accordance with the accepted psychophysical methods reported by Ayoub, et al. (1978).

Only the subject could adjust the workload; if he felt that he could work harder without straining himself, he added more weight to the box or removed weight if he felt the load was too heavy. As many adjustments as needed were accomplished by adding and removing assorted lead weights from the box. When the subject indicated that he had reached his capacity, he then completed a single lift. The box and weights were weighed on a standard scale and the weight recorded. Assorted lead weights were not marked individually as to their heaviness and the box was not weighed until the subject had left the task area.

The only lifting instructions given to the subjects specified grip position on certain simulated tasks. No specific method of lifting was suggested for the simulated tasks. Previous research in the field of manual materials handling has shown "free style" lifting to be more appropriate than a structured lifting style.

For the hold/position tasks, each subject chose his weight as he did for the lifting tasks as well as his own manner of lift. If the subject could not hold the load for the full time required, he was asked to rest and readjust the load to a weight he could maintain in position the full time required.

For the Push/Pull tasks, subjects were asked to exert their maximum Push or Pull effort and sustain it for three seconds. Each subject was asked if he felt that was his maximum, if the answer was negative, the test was repeated. Since these tasks involved no manipulation of load

weights; simply an applied force to stationary object, the subjects had no adjustments to make.

The Carry tasks were similar to the Lift/Lower tasks in that the subjects were asked to adjust the lead weight load until their maximum was reached. The Carry tasks differed because in addition to lifting a weighted box, the subjects carried it for fifteen feet to complete the task. If the subject was unable to carry the weighted box the required distance, he was asked to readjust the weights until the maximum amount was reached which could be carried the distance.

Illustrations and descriptions of these simulated tasks are given in Figures 17 through 29.

B. DEVELOPMENT OF CANDIDATES TESTS

A variety of candidate tests involving strength and/or endurance components were initially considered as potential tests for strength/stamina. Table 13 shows a summary of these tests. In order to conduct a meaningful analysis of potential candidate tests an initial screening procedure was used to reduce the number of feasible tests. The following criteria were used in the initial screening to exclude potential candidate tests from further consideration:

(1) Test required sophisticated equipment and/or extensive training in testing procedures and analysis of results. This eliminated those tests requiring oxygen consumption analysis such as maximum aerobic capacity, and many static and dynamic strength tests.

(2) Test exceeded space or time constraints of a typical AFEES (MEPS) screening procedure. This eliminated many of the running type fitness tests such as sprints, shuttle runs, dodge runs and distance runs.

(3) Test was of questionable safety. Eliminated from consideration due to safety factors were tests involving the handling of free weights (potential for dropping) and tests suspected to be hazardous such as back strength tests.

(4) Test was of questionable reliability or validity. Many fitness type tests involving the subject's body weight such as pull-ups, rope climbing, push-ups were not considered because of the lack of consistency of test load. Other tests such as medicine ball put, softball throw, vertical jump, broad jump, sit-ups, squat thrust, leg raises, etc. were excluded because they lacked a recognized and valid relationship between the tests and the simulated manual materials handling tasks previously identified.

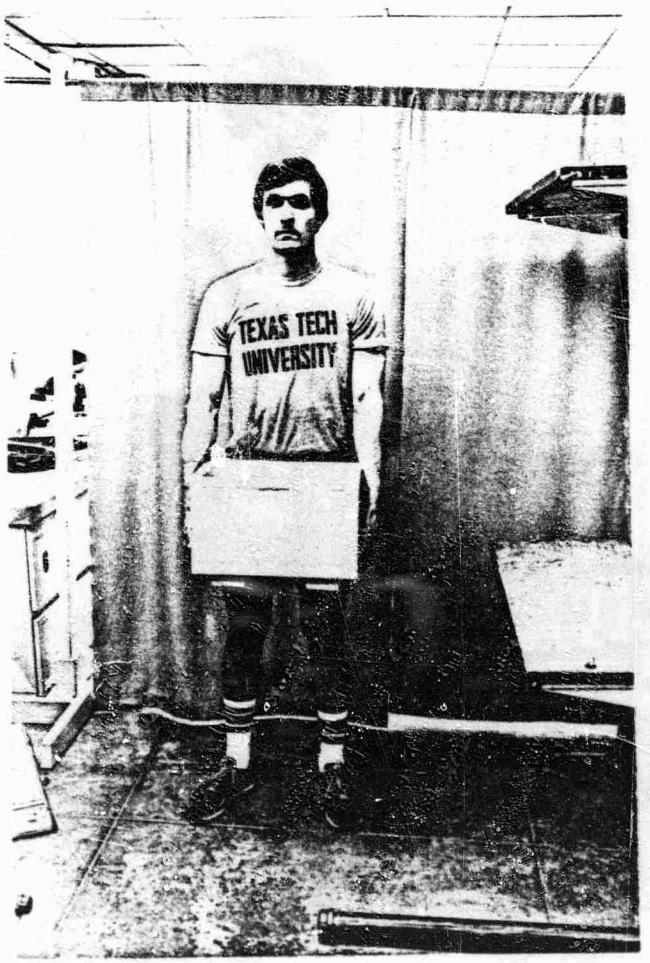


Figure 17. Lift to Knuckle Level (L6): The subject lifted a box (17.5" x 11.5" x 9.75") from the floor to knuckle height. The subject was instructed to pick up the box and stand erect with arms extended straight down, holding the loaded box against his lower body.

Figure 18. Lift to Workbench Level (L7): The subject was required to lift a box (17.5" x 11.5" x 9.75") from the floor to workbench height (30" above the floor).

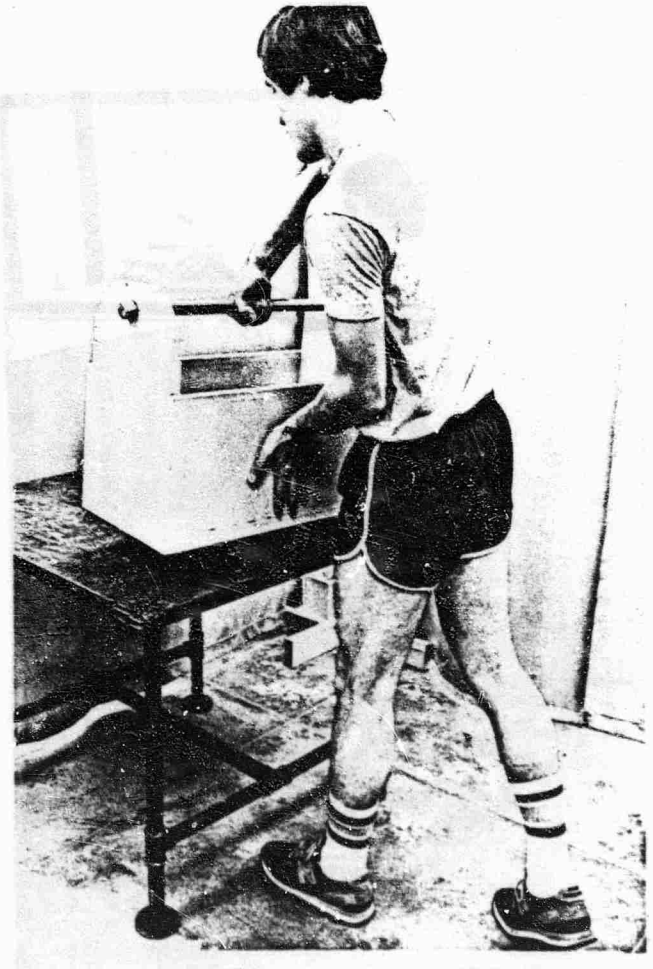


Figure 19. One-Hand Tool Box Lift to Workbench Level (L2): The subject was required to perform a one-handed lift. The box measured 24" x 12" x 11.75" and was fitted with a piece of pipe running the 24" length of the box at a height of 19" from the bottom of the box. This task simulated the lifting of a tool box to workbench height (30" from the floor).

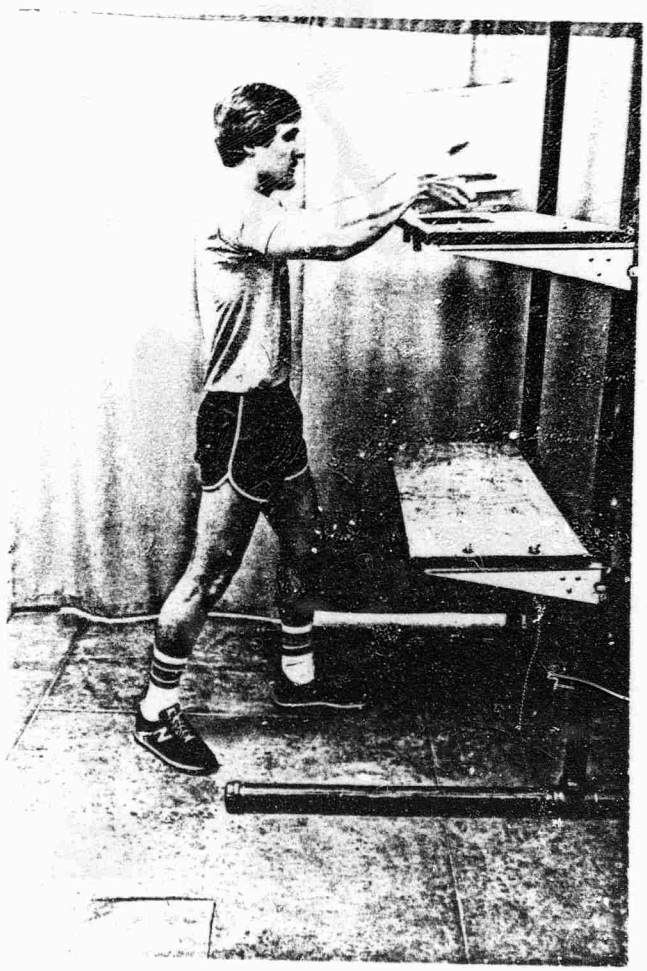


Figure 20. Lift to Shoulder Level (L8): Each subject lifted a box (17.5" x 11.5" x 9.75") from the floor and placed it on a shelf located at the subject's shoulder height.

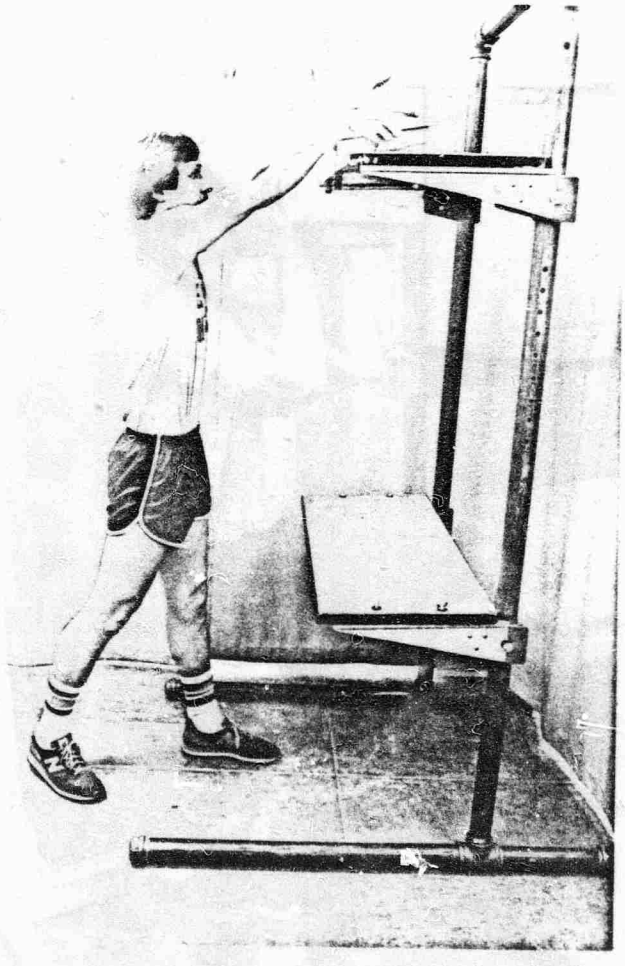


Figure 21. Lift to Reach Level (L9): Each subject lifted a box from the floor to a height of 70" and placed it on a shelf. The box used in this task measured 16" x 10" x 9.5" and again was not equipped with handles but did have runners along the bottom of the box to aid the subject in gripping the box.

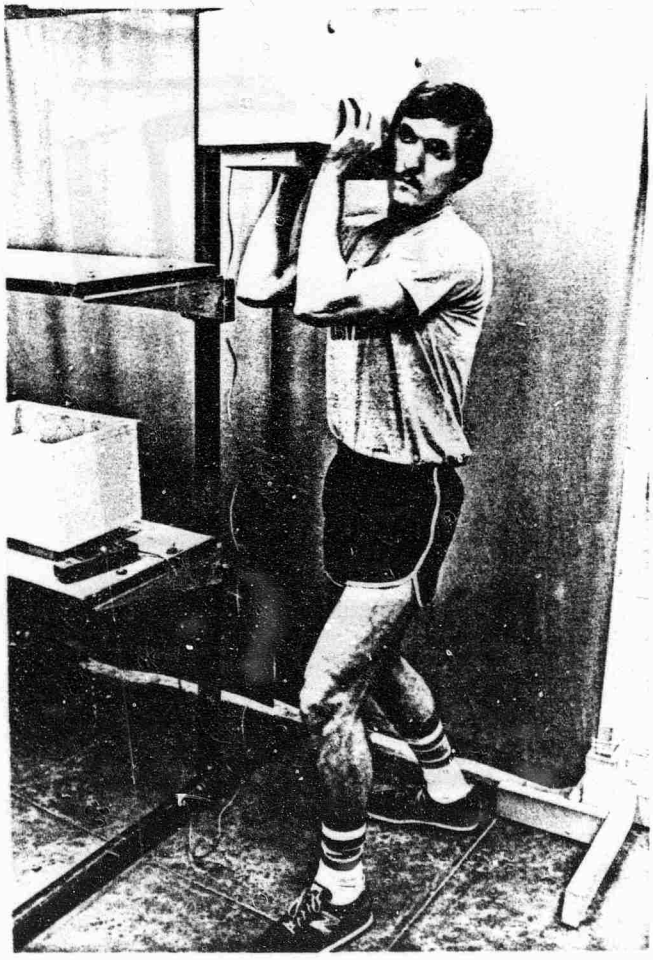


Figure 22. Hold/Position at Shoulder Level (H3): The subject was asked to hold a box (17.5" x 11.5" x 9.75") in position at shoulder height for five seconds. A safety chain was provided in case the subject dropped the load.

Figure 23. Hold/Position at Reach Level (H4): The subject was asked to hold a box (17.5" x 11.5" x 9.75") overhead, approximately 6' above the floor for 5 seconds. A safety chain was provided in case the subject dropped the load.

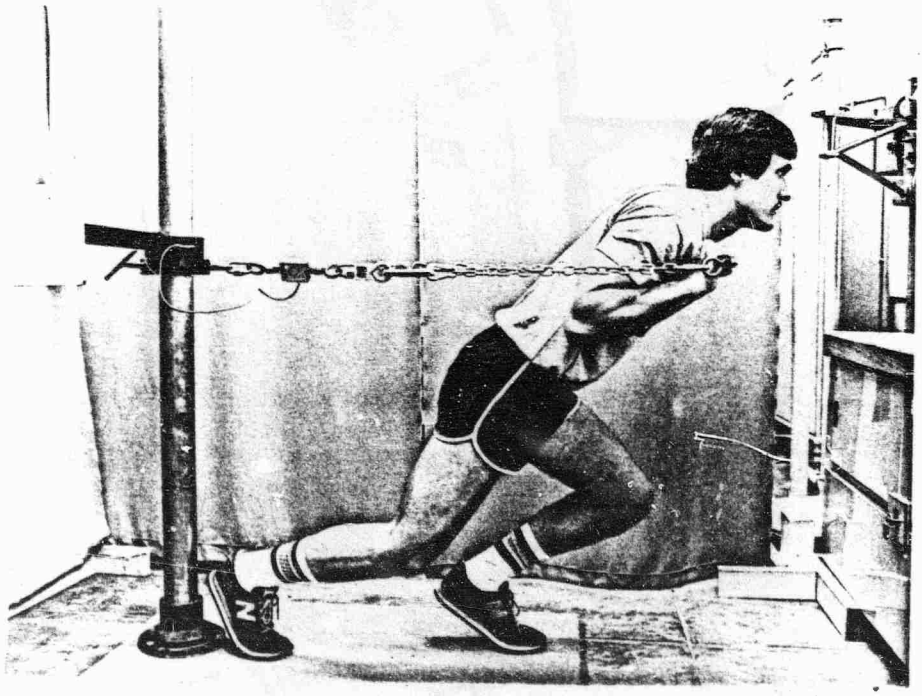


Figure 24. Waist Level Push (P1): Each subject was instructed to grasp the rod with an overhand grip and push into the waist high rod with the maximum possible force and sustain this effort for 3 seconds.

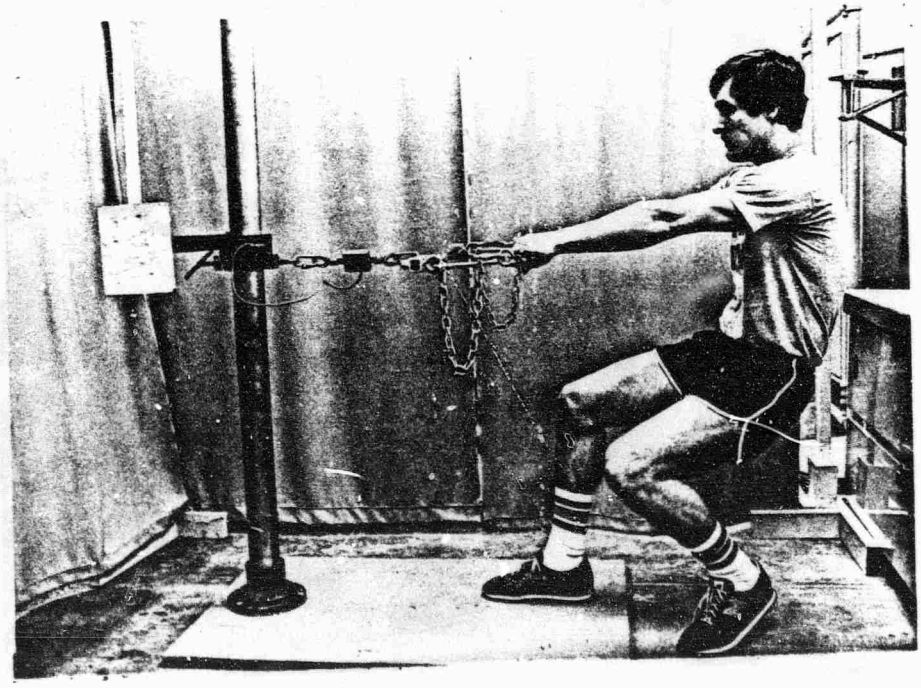


Figure 25. Waist Level Pull (P2): Each subject was instructed to grasp the waist height rod and pull with the maximum possible for for 3 seconds.

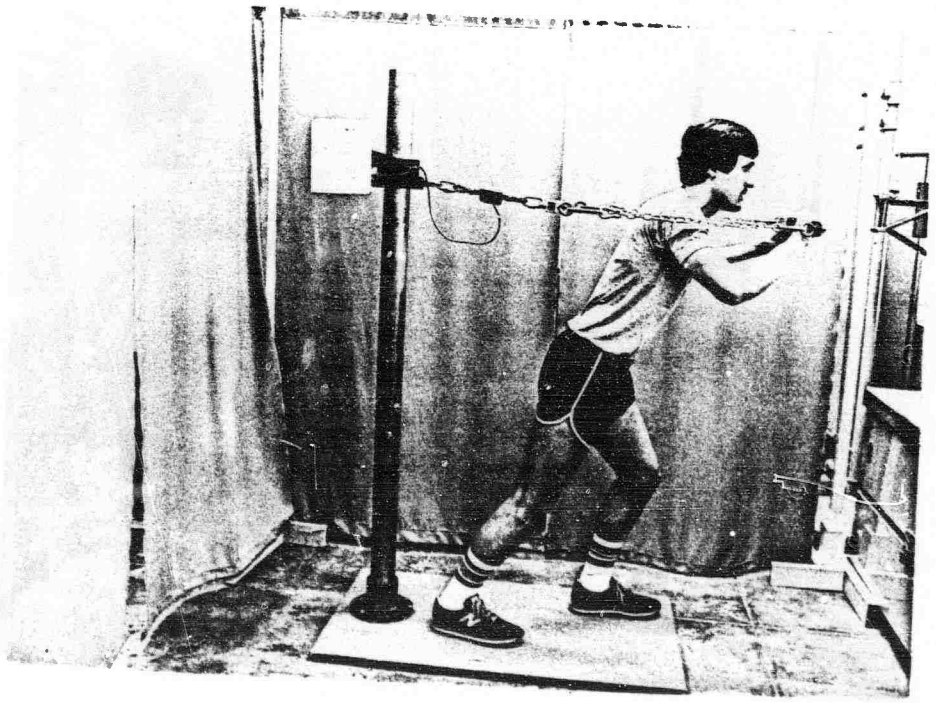


Figure 26. Shoulder Level Push (P3): Each subject was instructed to grasp the shoulder height rod and push with the maximum possible force for 3 seconds.

Figure 27. One-Hand Tool Box Carry (C2): Each subject lifted a tool box measuring 24" x 12" x 11.75" with one hand and carried the box at his side a distance of 15 feet. This task simulated the lifting and carrying of a tool box in the workplace setting.

Figure 28. Two-Hand Side Carry (C3): Each subject lifted a box (17.5" x 11.5" x 9.75") without handles and carried it at his side a distance of 15 feet.

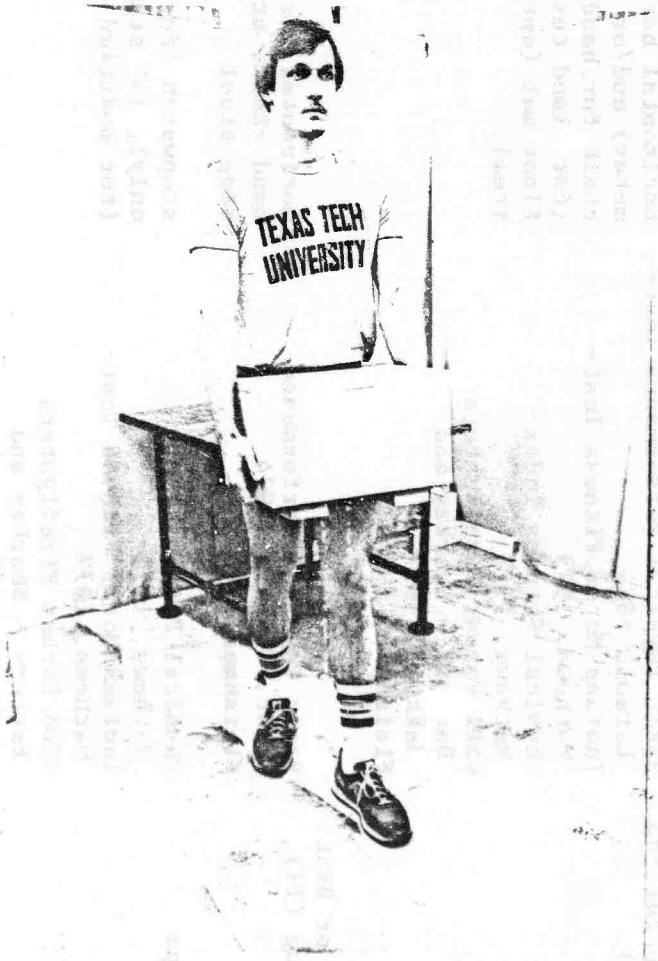


Figure 29. Two-Hand Front Carry (C4): Each subject lifted a box (17.5" x 11.5" x 9.75") without handles and carried it positioned at his front a distance of 15 feet.

TABLE 13. TESTS CONSIDERED FOR STRENGTH/STAMINA

Component Tested	Test Name(s) MIL-STD 882- Hazard Category	Reference	Equipment Needed
I. Arm/Shoulder Strength			
A. Dynamic	Chin-up/Pull-up (II)	Basic Physical Performance Test- Larson, 1974 Indiana Motor Fitness Test- Mathews, 1973 Physical Fitness Index- Mathews, 1973 USDA Forest Firefighters Battery - Sharkey and Jakkula, 1977 Fleishman, 1964b	horizontal bar (2-5cm diameter) and/or still rings, chalk for hands, stopwatch (for timed test only), floor mat (optional-safety item).
	Flexed or Bent Arm Hang (II)	Basic Physical Performance Test - Larson, 1974 Fleishman, 1964b	horizontal bar (2-5 cm) hand chalk, stopwatch, step stool
	Push Ups (II)	Physical Fitness Index- Mathews, 1973 Indiana Motor Fitness Test- Mathews, 1973 USDA Forest Firefighters Battery - Sharkey and Jakkula, 1977. Fleishman, 1964b	stopwatch (for timed tests only), 13" stall bar bench (for modified version only)
	Push Weights (II)	Fleishman, 1964b	padded bench (6' long x 1' wide X 1 1/2' high, barbell (37 lbs. total), stopwatch

TABLE 13. TESTS CONSIDERED FOR STRENGTH/STAMINA (Continued)

Component Tested	Test Name(s) MIL-STD 882- Hazard Category	Reference	Equipment Needed
B. Static	Hand Grip Strength (II)	Physical Fitness Test- Mathews, 1973 Basic Physical Performance Test - Larson, 1974 Basic Fitness Battery - Fleishman, 1964b.	hand grip dynamometer
II. Leg/Hip Strength A. Dynamic	Deep Knee Bends (II)	Fleishman, 1964b.	stopwatch
	Push Weights Feet (II)	Fleishman, 1964b.	quadricep boots with weights, floor mats (4" thick), stopwatch
B. Static	Leg Extension- Standing (II)	Physical Fitness Index- Mathews, 1973	dynamometer with platform handle, and chain; stabilizing strap
III. Trunk Strength A. Dynamic	Sit-Ups (II)	Basic Physical Performance Test - Larson, 1974 USDA Forest Firefighter Battery - Sharkey and Jakkula, 1977. Fleishman, 1964b.	floor mat, stopwatch
B. Static	Trunk Extension (II)	Kamon and Goldfuss, 1977 Clark, 1966	test table or upright test device, anchoring strap, dynamometer or load cell

TABLE 13. TESTS CONSIDERED FOR STRENGTH/STAMINA (Continued)

Component Tested	Test Name(s) MIL-STD 882- Hazard Category	Reference	Equipment Needed
	Trunk Flexion (II)	Clarke, 1966	test table, anchoring strap, dynamometer
	Leg Raiser (II)	Fleishman, 1964b	floor mat, stopwatch
	Hold Half-Sit-Up (II)	Fleishman, 1964b	floor mat, stopwatch
IV. Cardiovascular Fitness			
	50 M Sprint (III)	Basic Physical Performance Test - Larson, 1974	stopwatch, 50 M straight course
	Cooper 12 min, Run/Walk (IV)	Larson, 1974	stopwatch measured course
	Ohio State Univ Step Test (IV)	Mathews, 1973	stopwatch, stepping bench with handbar, metronome, pulse meter (may be done by hand by experienced individual).
	Billings Treadmill Test (IV)	Mathews, 1973	treadmill, heart rate monitor, oxygen analyzer, flowmeter.
V. Flexibility			
A. Dynamic	Bend, Twist & Touch (II)	Basic Fitness Battery - Fleishman, 1964b	chalk or tape for marking, stopwatch.
B. Extent	Trunk Flexion Standing (II)	Basic Physical Performance Test - Larson, 1964	stable bench or platform, calibrated marker.
	Sitting (II)	Basic Physical Performance Test - Larson, 1964 Wells Sit and Reach Test - Mathews, 1973	fixed vertical footrest, calibrated marker.

TABLE 13. TESTS CONSIDERED FOR STRENGTH/STAMINA (Continued)

Component Tested	Test Name(s) MIL-STD 882- Hazard Category	Reference	Equipment Needed
VI. Manual Materials Handling Tests			
Lifting A. Static	Back Strength Arm Strength	McDaniel, 1972; Dryden, 1973; Knipfer, 1974; Ayoub, et al, 1978	strength test platform load cells
B. Dynamic	Lifting Strength	Aghazadeh, 1982; Pytel & Kamon, 1981	Cybex, mini-gym
VII. Other			
A. Agility	Shuttle Run (III)	Basic Physical Performance Test - Larson, 1974 Basic Fitness Battery - Fleishman, 1964b Dodge Run - Fleishman, 1964b	stopwatch, upright standards wooden blocks (if carrying required)
B. Gross Body Equilibrium	Rail Walking (II)	Fleishman, 1964b Field Battery Test - Bernauer & Bonnano, 1975	balance beam or elevated boards in appropriate configuration
C. Explosive Strength	Standing Broad Jump (II)	Indiana Motor Fitness Test - Mathews, 1973 Basic Physical Performance Test - Larson, 1974 Fleishman, 1964b	tape measure, secured mat or jumping pit
D. Gross Body Coordination	Cable Jump (III)	Fleishman, 1964b	rope (24" long)
E. % Body Fat	Skinfold Thickness (I)	Field Battery Test - Bernauer & Bonanno, 1975 Doolittle, 1975	skinfold calipers

The next step in the selection of candidate strength/stamina tests was to evaluate the tests in the ergonomics laboratories at Texas Tech University. Some of the initial evaluation was discussed by Smith and Ayoub (1982) in the final report of the interim modification of the X-factor test. Among the equipment available for evaluation was a modified incremental weight machine similar to those currently in use at the AFEES (MEPS). The modified weight machine had a range of movement from one foot above the floor to seven feet above the floor. The modified weight machine utilized 10 pound load increments over a range of 40 to 200 pounds. Other equipment evaluated in conjunction with the candidate tests were a load cell and digital readout, and a hand dynamometer.

A laboratory study was conducted at Texas Tech University to obtain comparison data between the simulated tasks and the potential strength/stamina tests. Seventy students (age 18-21) served as research subjects for the development and testing of the proposed simulated tasks and candidate strength/stamina tests. The following candidate tests were evaluated on the modified incremental weight machine by the student subject population:

1. incremental weight lift to 6 feet,
2. incremental weight lift to shoulder height,
3. incremental weight lift to waist height,
4. incremental weight lift to knuckle height,
5. 70 pound elbow height hold time,
6. 70 pound shoulder height hold time,
7. 70 pound six foot height hold time,
8. 70 pound repeated lift to 6 feet,
9. repetition test using 10 pounds less than the maximum 6 foot incremental lift weight.

The number of candidate tests on the incremental weight machine was reduced by statistical analysis which examined correlation coefficients of variables as well as the order in which the variables entered the regression equations for predicting simulated task performance. Based on these results the following candidate tests for the incremental weight machine were selected for field testing:

1. an incremental lift to six feet to establish a maximum, X1,
2. an incremental lift to elbow height, X2,
3. a 70 pound hold at elbow height, X3,
4. an incremental lift to knuckle height, X7.

In addition to the lifting and holding tasks, three push/pull tasks were selected for incumbent testing, along with a grip strength test. The additional candidate tests were:

5. a one handed pull, X11,
6. hand grip strength, X8,
7. a 38 cm vertical pull, X9, and
8. an elbow height vertical pull, X10.

The handgrip strength, 38 cm vertical pull and elbow height vertical pull were selected because they are tests being evaluated by the Army and Navy and could provide a good comparison to the Army or Navy data should they decide to use those candidate tests. The tests were also representative of the push/pull simulated tasks described earlier.

The first three tests have been administered at Basic Military Training at the request of AFAMRL thus provided comparison data.

All strength testing was self-limiting, with the subject determining the maximum amount of weight that could be lifted, or the maximum duration of holding a weight. The subject was asked to perform at a level that would be considered his or her maximum acceptable level of physical exertion in any Air Force job. Subjects were told to stop the experiment at any time if they felt over-stressed. No information regarding performance was made available to the subject. During performance of the tests the subject was isolated from other subjects in an attempt to eliminate competition and other external influences.

Illustrations and descriptions of the candidate tests are given in Figures 30 through 37.

C. INCUMBENT SAMPLING PLAN

A sampling plan was developed to test incumbents based on their AFSC. The objective was to emphasize Factor X-1 and X-2 AFSCs. Consideration was also given to obtaining AFSCs representative of the different AF commands, weapons or aircraft systems, etc. It was recognized, however, that this could not be an inflexible plan. Base coordinators had to be given the option of making substitutions to prevent any disruption of primary base functions.

The original sampling plan was also modified by the selection of retest subjects. These were individuals who participated in strength testing during basic military training at Lackland AFB. (they were given one of two tests: ability to lift 70 lb to 6 ft. or holding endurance for 70 lb. at elbow height). The CBPO contact was given the names and AFSCs of these individuals and requested to try to schedule them first. Since the availability of these individuals was unknown, the AFSCs originally selected for that base were divided into two priorities. First priority was given to AFSCs unique to that base. Second priority was given to AFSCs that were more common across bases. After scheduling the retest subjects, the base contact was to obtain additional subjects by AFSC priority. If additional subjects were

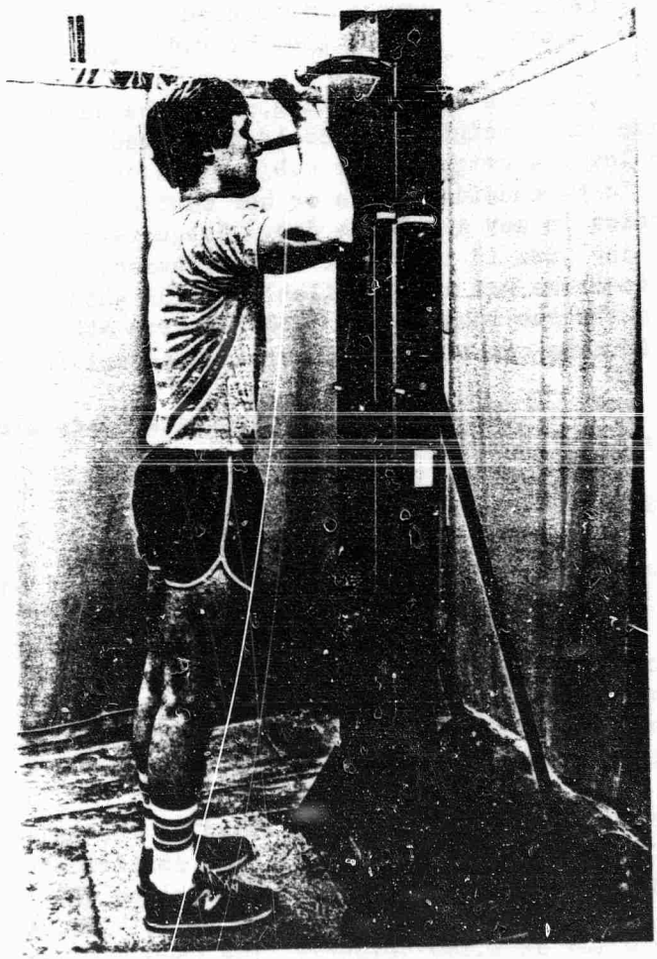


Figure 30. Lift to Six Feet (X1): Subject lifting a weight to a height of 6' using the modified Air Force Lifting Machine.

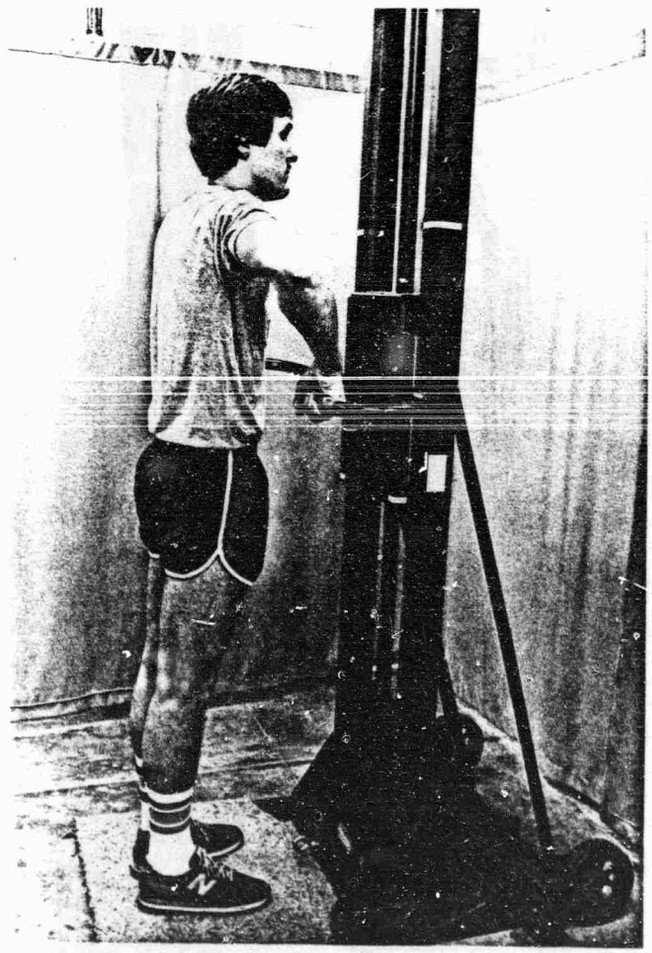


Figure 31. Elbow Height Lift (X2): Subject holding a weight at elbow height using the Modified Air Force Lifting Machine.

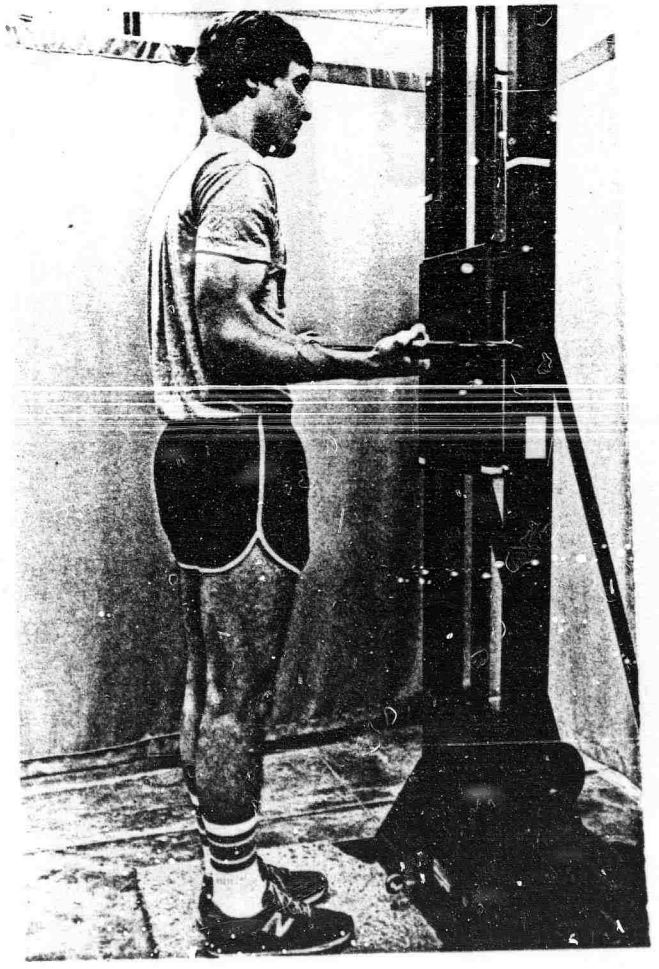


Figure 32. 70 lb. Elbow Height Lift/Hold (X3): Subject holding a weight (70 lbs.) at elbow height using the Modified Air Force Lifting Machine.

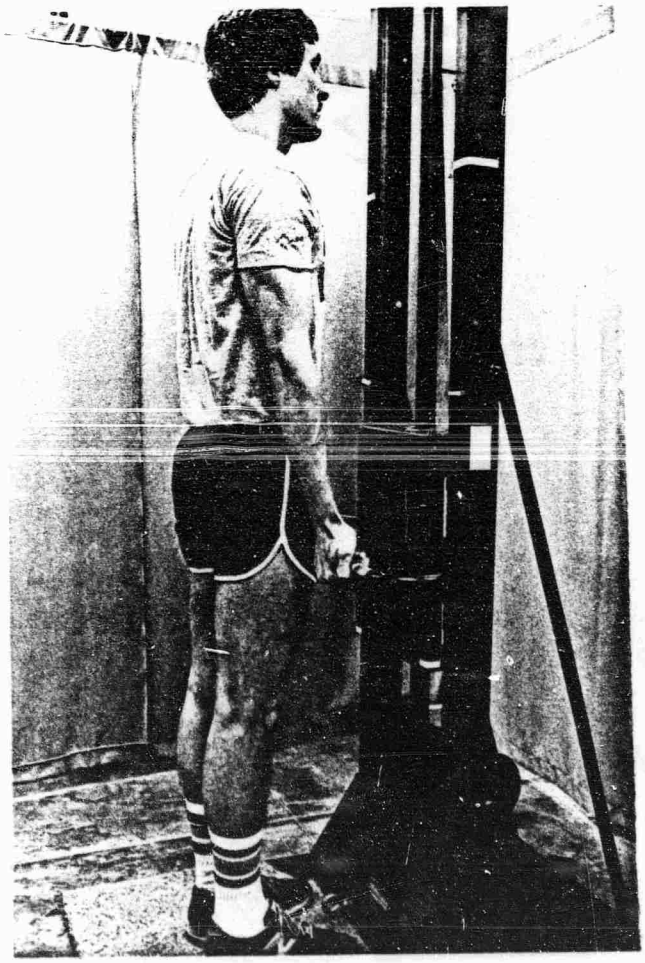


Figure 33. Knuckle Height Lift (X7): Subject lifting a weight to knuckle height using the Modified Air Force Lifting Machine.

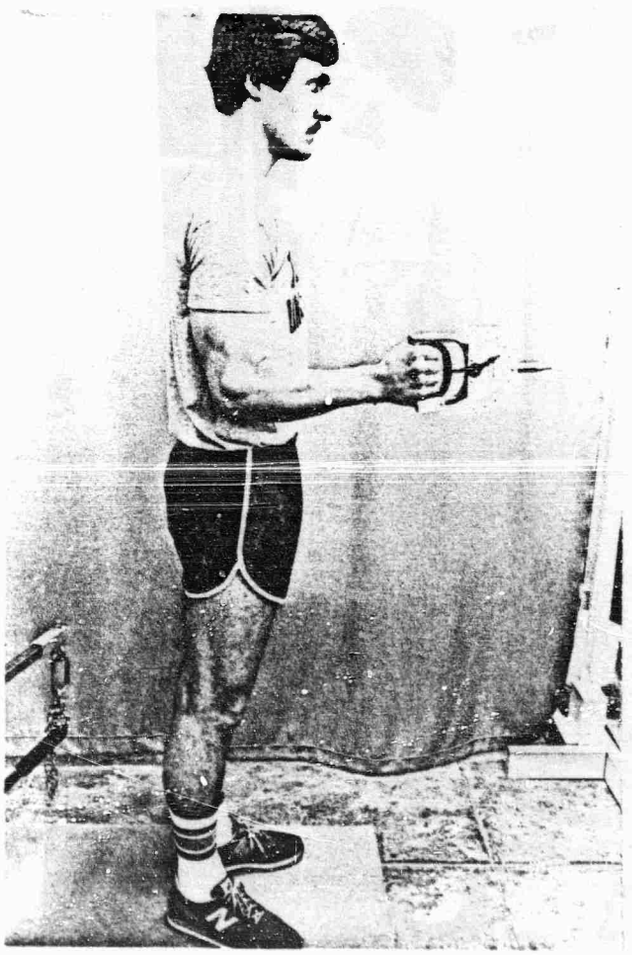


Figure 34. Hand Grip Dynamometer (X8): The subject was asked to hold the hand grip dynamometer in his dominant hand (right or left handed) and squeeze as hard as he could. The dynamometer was positioned to prevent the subject from observing the reading resulting from his efforts.

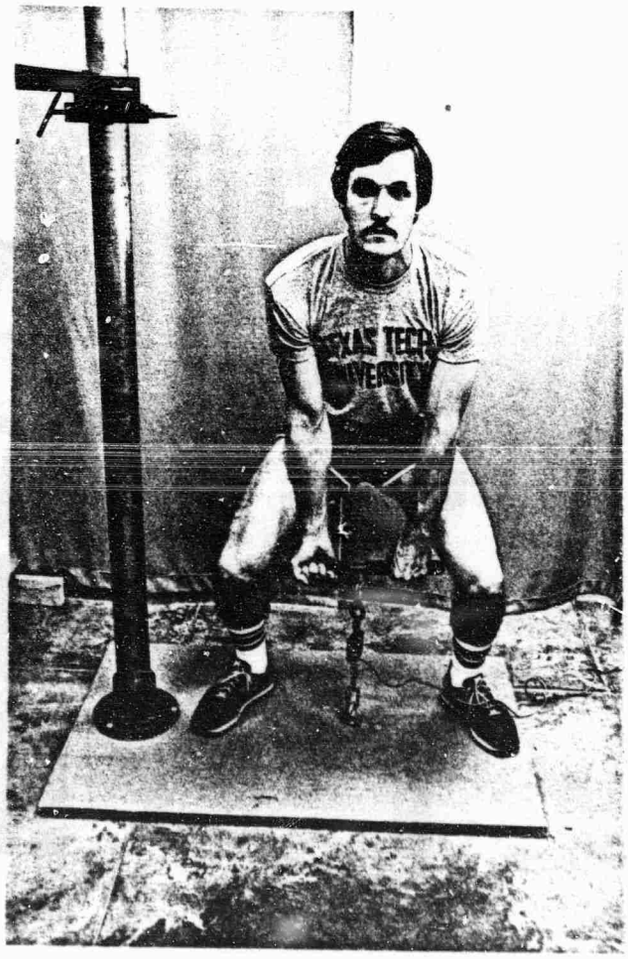


Figure 35. 38 cm Vertical Lift (X9): The subject was asked to grasp the double handle rod with an alternate over and underhand grip and pull vertically with the maximum possible force for 3 seconds.

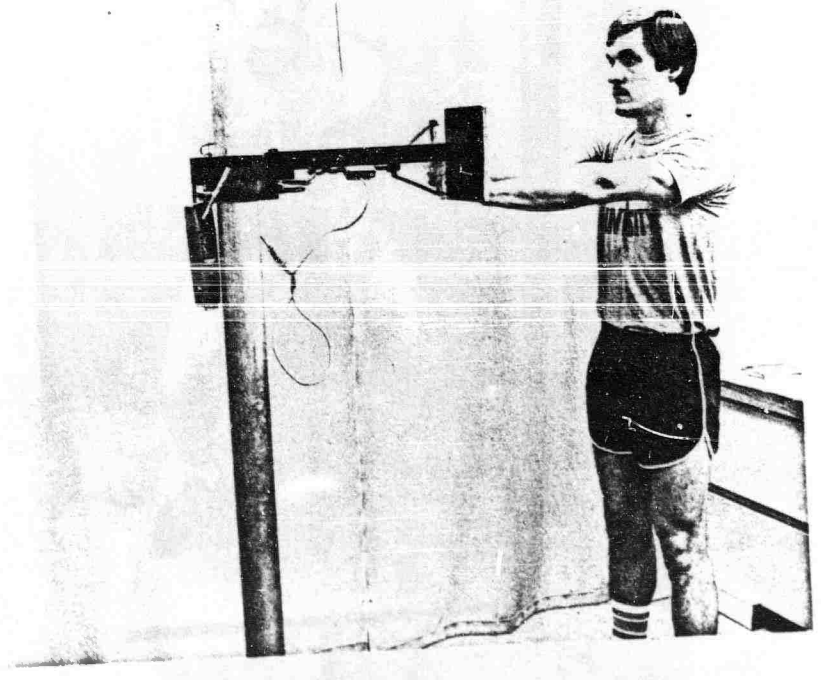


Figure 36. One-Hand Pull (X11): The subject was instructed to place his left hand flat on the push board and to grasp the handle with his right hand, and pull the handle horizontally toward him with the maximum possible force (for 3 seconds) while pushing for leverage simultaneously with the left hand.

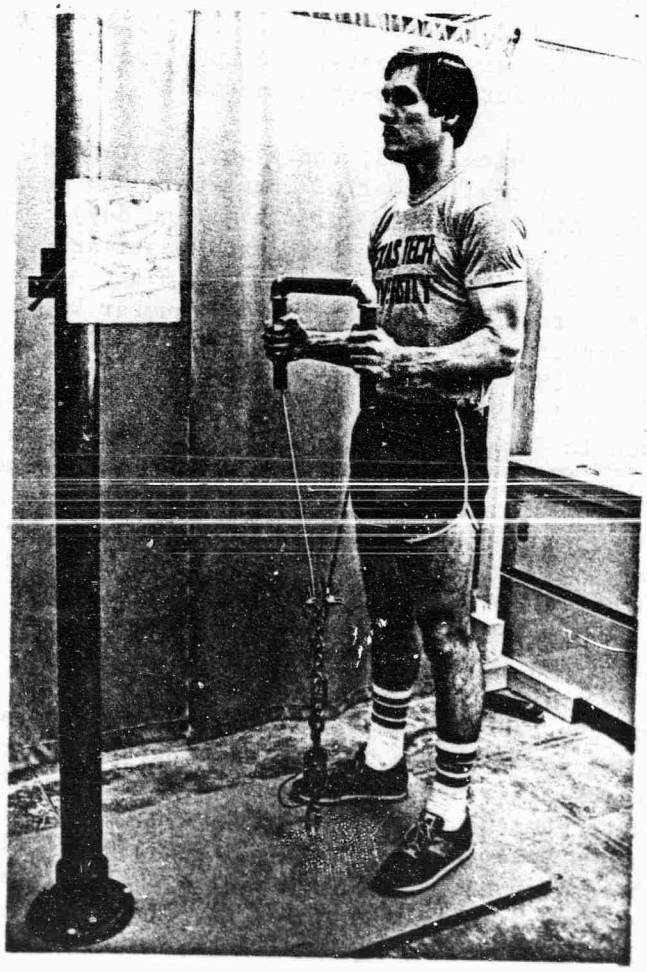


Figure 37. Elbow Height Lift (X10): The subject was instructed to grasp the U-shaped rod handles, adjusted to elbow height, and pull vertically with the maximum possible force for 3 seconds.

still needed, he was to use the ten most populated AFSCs in the AF (702x0, 811x0, 431x2, 431x1, 645x0, 462x0, 811x2, 426x2, and 902x0) or any other AFSC necessary to obtain the desired number of subjects for each test period.

The incumbent testing schedule was designed to have four periods consisting of two half days. Since Monday morning was used for equipment set-up and calibration, the first period consisted of Monday afternoon and Tuesday morning; the second period was Tuesday afternoon and Wednesday morning; etc. It was originally estimated that 20 individuals could be tested in each period. To allow for medical disqualifications and voluntary dropouts, the CBPO contact was requested to schedule 25 people for each testing period.

Thus with visiting nine bases, there was a potential of testing 720 incumbents. The actual number of incumbents who completed the testing was 527 (a few did not return for the second day). The number actually tested was lower than originally estimated for several reasons. The number of individuals excused for medical reasons was slightly larger than expected as was the number who decided not to voluntarily participate. In addition, due to alerts or other base situations, the CBPO contact was not always able to schedule 25 in every period or individuals could not keep their appointment. A summary is given in Table 14 of the number of incumbents tested by AFSC. A total of 157 AFSCs (plus shredouts) or 42% of 374 possible were included. A summary of the number of incumbents and AFSCs covered within each current X-Factor groups is shown in Table 15. The incumbents tested represented 58% and 46% of available Factor X-1 and X-2 AFSCs, respectively.

D. BASE TRIPS FOR INCUMBENT TESTING

In selecting the bases to be visited for incumbent testing, consideration was given to the type of command and the variety of AFSCs available to obtain a sample representative of the AF. For example, SAC bases were chosen to obtain AFSC's emphasizing missles and bombers. Among bases with similar missions, physical location was used as a selection criterion to minimize costs. The bases selected and dates visited are given in Table 16. The location of the bases and the trip route are illustrated in Figure 38.

Official coordination with the bases was handled by the designated official from the program technical monitors office (AFAMRL) in a fashion similar to that used for the interview trips. A contact person at each base CBPO was identified in this procedure. A liason individual from the TTU team then worked with each base contact to supply them lists of requested AFSCs and retest personnel and to coordinate the details of the base visits. Due to equipment constraints, it was necessary to obtain a room at least 30' square with a 9'

TABLE 14

SUMMARY BY AFSC OF INCUMBENTS TESTED

AFSC	A	B	C	AFSC	A	B	C	AFSC	A	B	C	AFSC	A	B	C
111x0	2		1	326x6c	4	1	2	445x0g	3		1	811x2	10		1
112x0	1		1	326x7	4	1	2	461x0	7	4	2	811x2a	3		1
114x0	8	5	1	326x7b	1		2	462x0	13	3	2	821x0	1		2
121x0	3		1	326x7c	4		2	463x0	1		2	871x0x	3		2
122x0	3		1	326x8	3	1	2	464x0	5		2	902x0x	4	2	2
201x0	1	1	3	326x8c	5		2	472x1a	1		2	902x0a	3		2
222x0	3		1	328x0	6	3	2					902x0c	4		2
231x0	2		2	328x1	3	1	2	472x2	2		2	902x2	5	1	2
242x0	2		2	328x3	3	1	1	472x3	1		2	902x2b	1		2
251x0	2		2	328x4	1		2	542x0	6		2	903x0	3		2
272x0	2	1	3	341x3	1		2	542x1	4		1	905x0	4	1	2
273x0	2		2	341x4	4		2	542x2	4		2	906x0	3	2	3
291x0	7	3	2	341x6	2		2	545x0	8		1	907x0	5		2
293x3	2		2	361x1	5		1	545x1	1		2	908x0	3		2
302x0	2		2	362x3	2		2	545x2	4		1	911x0	1		2
303x1	1		2	362x4	4		1	551x0	3		1	913x0	2		2
304x1	2		2	392x0	1		2	551x1	2		1	914x1	2		2
304x4	5		2	404x1	3	3	2	552x0	5		1	915x0	3		2
304x5	1		2	423x0	3		2	552x1	3		1	918x0	4		2
305x4	1		2	423x1	6	3	2	552x4	2		2	981x0	2	1	3
305x4g	1	1	2	423x2	2		1	552x5	7		2				
306x0	4		2	423x3	6	1	2	553x0	3		2				
306x1	3		2	423x4	6	2	2	556x0	1		2				
306x2	3		2	423x5	5	1	2	566x1	5	1	2				
307x0	1		2	426x2	6	2	2	571x0	5		1				
316x0	3		2	426x3	3		2	602x1	2		2				
316x0g	5	1	1	427x0	1		2	603x0	4	1	2				
316x1p	1		1	427x1	5		2	605x0	1		2				
316x2g	2		1	427x3	1		2	605x1	4		2				
316x3	1	1	2	427x5	9	3	2	622x0	2		3				
321x01	1		1	431x0c	2		1	622x1	1		3				
321x1g	2		1	431x0d	6		1	631x0	8	1	1				
321x2	1		2	431x1	10	4	1	645x0	9	2	3				
321x2p	1		2	431x1b	3		1	645x0a	1	1	3				
324x0	1		2	431x1c	1		1	645x1	5		2				
325x0	2		2	431x2	16		1	691x0	1	1	3				
325x1	4	1	2	413x2a	2		1	702x0a	3	1	3				
326x3	3		2	431x2b	1	1	1	702x[illegible]	8	6	3				
326x3b	2		2	431x2c	7	1	1	702x0c	1		3				
326x4	1		2	431x2d	1	1	1	732x0	7	1	3				
326x4a	1		2	431x2e	4	2	1	732x1	1		3				
326x4b	2		2	431x2g	1	1	1	733x1	3		2				
326x4c	6	2	2	431x2z	1		1	753x0	7		3				
326x5b	2		2	443x0	1		2	791x0	4		2				
326x6	3		2	443x0g	4		1	791x1	1		2				
326x6a	2	2	2	443x0p	2		2	811x0	11	1	1				

A = # of airmen tested
B = # of airmen also tested by AF
C = X factor

TABLE 15

SUMMARY BY X-FACTOR OF INCUMBENTS AND AFSCs TESTED

	X-Factor			Total
	1	2	3	
Number of Incumbents Tested	171	307	49	527
Percent of Total Incumbents Tested	32+	58+	9	100
Number of AFSCs/ Shredouts Tested	42	100	15	157
Number of AFSCs/Shredouts in AF*	72	218	84	374
Percent of AFSCs/Shred Tested	58	46	18	N/A

* From AFR 39-1 (C9) Atch 55, dated 20 April 1981

TABLE 16

BASES VISITED FOR INCUMBENT TESTING

Trip	Dates	Base/Location	MAJCOM
0		Reese AFB	
1	March 1-5,82'	Dyess AFB Abilene, TX	SAC
2	March 22-26,82'	Little Rock AFB Little Rock, AR	SAC
3	March 29 April 2, 82'	Scott AFB Belleville, IL	MAC/ AFCC
4	April 5-9, 82'	Wright-Patterson AFB Dayton, OH	AFLC
5	April 19-23, 82'	F.E. Warren AFB Cheyenne, WY	SAC
6	April 26-30, 82'	Hill AFB Ogden, UT	AFLC/ TAC
7	May 10-14, 82'	Travis AFB Fairfield, CA	MAC
8	May 17-21, 82'	Nellis AFB Las Vegas, NV	TAC
9	May 24-28, 82'	Cannon AFB Clovis, NM	TAC

Figure 38. Van Route for Base Validation Visits

ceiling to use for testing. In addition, an attached or adjoining area was needed where subjects could wait between testing cycles. This created a "challenge" on some bases where space was at a premium, but the CBPO personnel were always able to arrange adequate accommodations for the testing.

Travel to the AF bases for collection of incumbent data was made in a specialty outfitted van dedicated to this purpose. Rear seats were removed and a winch installed for use in loading the lifting machine. The vehicle was also fitted with overload springs to handle the test equipment and associated weights. Once the van left Texas, it did not return until the end of the test period. Base officials at F.E. Warren and Travis AFB very kindly arranged for the van with its equipment to be stored on base during break periods for the test personnel.

The test team consisted of four people. One individual, a paramedic, was always a team member. The remaining positions were filled by ten people who collected data at one to seven of the bases.

E. SUBJECT TESTING PROCEDURE

Upon arrival at a scheduled Air Force Base, the Van Team Leader immediately met with the CBPO contact to get information as to testing facilities, subject lists/scheduling problems, etc.

The van was unloaded at the designated base testing facility and the strength testing equipment was set up. The van team arrived at a new base on a Monday morning and spent that morning setting up the testing stations. The first group of subjects were scheduled to begin testing at 1300 Monday afternoon. Each group was tested for two periods, Period I was 1300 - 1700 and Period II took place the following 0800 - 1200. This split testing schedule allowed Monday morning to be utilized for equipment unloading and setup and Friday afternoon for equipment disassembly, reloading and packing the van. There were four groups of subjects tested on each based scheduled as follows:

Group	I: Monday	1300-1700 &	Tuesday	0800-1200
Group	II: Tuesday	1300-1700 &	Wednesday	0800-1200
Group	III: Wednesday	1300-1700 &	Thursday	0800-1200
Group	IV: Thursday	1300-1700 &	Friday	0800-1200

The CBPO contact was responsible for the scheduling of individual subjects at that base and usually supplied the van team leader with a roster of subjects for the four groups scheduled for the entire week.

The strength aptitude test equipment was set up in a room supplied by the CBPO contact. Because the size and shape of these rooms varied considerably from base to base, the equipment configuration was also varied to match the restriction imposed by the room itself.

Each equipment "station" was screened by curtains to provide privacy and prevent subjects from observing each other's performance while being tested. The subject waiting area was usually located to prevent "spectator" observations of subjects being tested. At one base they were able to see people carrying boxes but not the weight involved.

The orientation of the testing groups took place at the testing site, subject waiting area at 1300 each day (Monday thru Thursday). Subjects were requested to appear by the CBPO contact through their First Sergeants. After a reasonable period of time (usually in 30 mintues after appointed assembly time one of the team researchers conducted a roll call. Missing subjects were noted and listed as "no shows". Present subjects were given a pen and information/consent/ medical history forms for the orientation session.

The orientation session consisted of a tape recording which verbally presented the same material/information contained in the consent form packet which each subject had. During the course of the session subjects were requested to fill out and sign the medical histories and consent forms. (See Appendix E) These forms were counter signed by other subjects who served as witnesses for each other. The subjects were given the opportunity to ask questions and were occasionly given a brief "tour" of the testing stations prior to signing the consent forms and consenting to volunteer as test subjects. Finally, all volunteer subjects were assigned a code number and given a badge bearing that code number to wear during testing. Testers recorded test data on the data record sheets according to this code number. The subject code consisted of four colors (red, blue, green & yellow) with five subjects (maximum) in each color group. ie, red 1 thourgh red 5, blue 1 through blue 5, green 1 through green 5, yellow 1 through yellow 5. This coding system allowed a maximum of twenty subjects per testing group.

The subject coding system had another purpose beyond data recording as it allowed the testers to efficiently rotate all subjects through their stations without duplicating or forgetting individual subjects. This was accomplished by each station (four total stations) testing only subjects in a single color group and sequencing order. Each of the four stations tested only subjects from a different color code group. ie. push/pull station tested red group subjects, shelf station test only blue code subjects, weight machine station tested only green group subjects and the carry station tested only yellow group subjects.

At the end of the first testing period (usually 20 minutes), when all subjects in all color groups had been tested at their respective station, the testers rotated to the next color group and begin testing those subjects for the second testing period, i.e., the push/pull station tested only blue group subjects, the shelf station tested green

group subjects, the weight machine station tested yellow group subjects and the carry station tests red group subjects.

To insure that each subject received a minimum of 15 minutes resting time between physical strength tests one of the testers kept track of the times between testing color group subjects and spaced the time between test periods to maintain that resting period standard.

There were four "stations" setup at the base, each manned by a different team member. Five or six different tests were made at each station. Table 17 shows the measurements made at each station. In addition to the simulated tasks and candidate tests previously described, selected anthropometric measurements were also made. These are illustrated in Figure 39.

At the end of each day, known weights of 65 and 150 lbs were used to check the calibration of the scales. Four successive readings of each weight were made on each scale. The four readings were averaged and used to correct the incumbent data for scale drift.

F. ANALYSIS OF INCUMBENT TEST DATA

A team member being rotated back to Texas Tech, brought the data with him at the end of each week of testing. The data were then entered into computerized files as quickly as possible so preliminary analyses could be conducted. The data were placed into one of three files as appropriate for anthropometry, simulated tasks, or candidates tests. Their respective file structures are shown in Tables 18 through 20, each followed by an sample of a data printout (Figures 40 through 42).

The data file was analyzed by the Statistical Analysis System (SAS version 79.6). A summary of the incumbent anthropometric data is presented in Table 21.

A series of eight candidate tests for the strength aptitude test battery were conducted with the Air Force incumbents during the van visits to the nine bases. A summary of the data for males and females is presented in Table 22. A summary of the composite data including all males and female incumbents tested is presented in Table 23.

The incumbents also established their maximum level of performance on a series of thirteen simulated tasks during the van trips. Table 24 summarizes the performance data on the simulated tasks for both males and females. A composite summary of simulated task performance including all males and females tested is presented in Table 25.

The data file was analyzed by the Statistical Analysis Systems (SAS version 79.6). In considering the 13 simulated task variables as

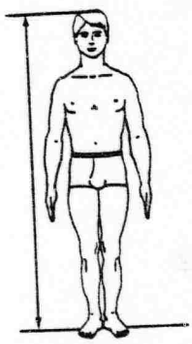
TABLE 17

CONFIGURATION OF INCUMBENT TESTING STATIONS

Weight Machine Station	Push/Pull Station
Incremental 6' lift	Waist level push
Elbow height lift	Waist level pull
70 lb Elbow hold	Shoulder level push
Knuckle height lift	38 an Vertical lift
Hand grip dynamometer	Elbow height lift
Anthropometry	One hand pull

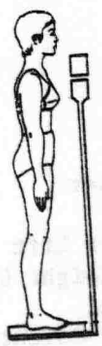
Carry Station	Shelf Station
One hand tool box carry	Shoulder level hold
Two hand front carry	Reach level hold
Two hand side carry	Lift to knuckle level
One hand tool box lift	Lift to shoulders level
Lift to workbench level	Lift to reach level

STATURE



Definition: The vertical distance from the standing surface to the top of the head. The subject stands erect and looks straight ahead.

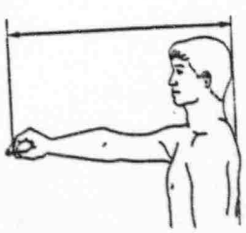
WEIGHT



SITTING HEIGHT

Definition: The vertical distance from the sitting surface to the top of the head. The subject sits erect, looking straight ahead.

THUMB-TIP REACH



Definition: The horizontal distance from the wall to the tip of the thumb, measured with the subject's back against the wall, his arm extended forward, and his index finger touching the tip of his thumb.

Figure 39. Anthropometric Measurements

TABLE 18

STRUCTURE OF CANDIDATE TEST DATA FILE

Field	Content
1-3	Subject Number
5-6	Base Number
8	Sex
10	Retest Identifier
12-18	AFSC
19-21	Maximum Six Foot Lift
23-25	Maximum Elbow Height Lift
27-31	70 lb Elbow Hold
33-35	Maximum Knuckle Height Lift
37-39	hand Grip Strength
41-43	38 cm Vertical Lift
45-47	Elbow Height Lift
49-51	One Hand Pull

130	02	M	1	329X1	110	140	50.4	200	47	282	95	146
131	02	M	0	306X2	100	140	33.6	200	42	214	67	103
132	02	M	0	631X0	100	120	16.8	160	44	233	73	130
133	02	M	1	114X0	120	140	39.6	200	56	267	90	160
134	02	M	0	114X0	120	170	43.8	200	45	258	94	114
135	03	M	0	30331	120	140	37.2	200	52	255	100	169
136	03	M	0	304X1	120	100	40.2	170	51	312	116	131
137	03	M	0	306X0	90	90	15.0	130	46	210	71	139
138	03	M	0	362X4	100	110	16.2	140	39	194	72	98
139	03	M	0	362X4	120	130	37.8	200	42	215	90	155
140	03	M	0	242X0	120	130	46.2	200	48	218	86	123
141	03	M	0	75350	120	130	39.0	200	56	190	87	141
142	03	M	0	306X0	150	150	57.0	200	49	311	112	152
143	03	F	0	392X0		60	0.0	120	28	112	45	108
144	03	F	0	231X0	60	70	11.4	110	31	100	38	47
145	03	F	1						25			
146	03	M	0	73230	130	130	48.0	200	57	200	94	61
147	03	M	0	306X1	110	130	27.0	200	60	258	96	150
148	03	M	0	81152A	120	140	39.0	200	43	215	85	112
149	03	M	0	329X0	150	170	45.0	200	50	272	90	151
150	03	M	0	43152	110	120	30.6	170	38	244	79	135
151	03	M	0	375CAMS	130	130	54.6	160	65	192	87	161
152	03	M	0	42632	140	150	72.6	140	54	215	94	183
153	03	M	0	902X0A	120	120	36.6	150	31	205	71	121
154	03	M	0	60231	100	100	31.8	130	46	250	78	130
155	03	M	0	60251	110	120	27.6	140	33	106	60	91
156	03	M	0	307X0	100	100	27.6	140	41	170	84	109
157	03	M	0	902X0C	100	100	24.0	160	49	220	75	130
158	03	M	0	42330	90	100	25.2	130	48	107	68	125
159	03	M	0	55235	120	130	30.0	200	43	290	85	117
160	03	M	0	42755	130	130	48.6	200	50	330	80	133
161	03	M	0	42330	140	140	45.6	200	34	240	92	150
162	03	F	0	25150	50	60	0.0	110	24	110	38	76
163	03	F	0	54530	60	80	12.6	100	24	144	59	124
164	03	F	0	55255	40	50	0.0	100	24	104	36	73
165	03	M	0					200	45			115
166	03	M	0	29333	120	120	29.4	200	40	210	87	105
167	03	M	0	30431	190	190	48.0	200	49	285	108	155
168	03	M	0	23150	140	140	33.6	170	42	185	88	128
169	03	M	0	24250	110	140	30.6	200	29	235	118	135
170	03	M	0	29333			62.4	200				
171	03	M	0	30650	130	140	34.8	200	36	230	133	134

Figure 40. Sample Printout of Candidate Test Data File

TABLE 19

STRUCTURE OF SIMULATED TASKS DATA FILE

Field	Content
1-3	Subject Number
5-9	Shoulder Level Hold
11-15	Reach Level Hold
17-21	Max. Lift to Knuckle level
23-27	Lift to Shoulder Level
29-33	Lift to Reach Level
35-39	One Hand Tool Box Carry
41-45	Two Hand Side Carry
47-51	Two Hand Front Carry
53-57	One Hand Tool Box Lift
59-63	Lift to Work Bench Level

Line Two

Field	Content
5-9	Waist Level Push
11-15	Waist Level Pull
17-21	Shoulder Level Push

```
017 155.0 132.0 151.8  81.1  66.1       119.9 115.9  91.3 196.4
    110.0 102.0  77.0  95.0
018             174.8 102.6  93.1       142.4 160.9  86.8 103.3
     85.0 140.0  74.0 140.0
019      78.0 118.1  69.6  66.6 108.3 119.4       69.8 146.4
     75.0  93.0  72.0 115.0
020 123.0 109.0                                179.9 106.8
    121.0                145.0
021  60.0  42.0  94.1  57.1  48.1  71.3  77.3  74.3  52.3  83.3
     45.5  90.0  50.0  95.0
022  95.0  39.0 115.1  81.1  80.1 114.4 119.4  83.8  81.3  95.3
     65.0  80.0  52.0 115.0
023      104.0 166.8  81.1  63.4 105.8 145.4 131.4  87.8 123.4
    101.0  82.0  47.0 130.0
024 113.0 101.0  95.6  75.6  54.1  88.8  85.3 122.4  72.8  82.8
     93.0  94.0  53.0 125.0
025      109.0 109.1  79.1  73.1  85.8  90.8 134.4  75.8  93.8
     87.0 100.0  52.0 116.0
026      121.0 153.8  82.1  64.1 105.8 117.4 132.4  80.8 129.4
    113.0 104.0  68.0 141.0
027           169.8 108.1  95.1 144.4 152.4 205.4  94.8 174.4
         111.0       147.0
028 173.0                101.6  98.6 146.4 180.4 144.4 127.4 126.4
    107.0 142.0  83.0 175.0
029 122.0  94.0 144.3  87.1  80.1  98.8 147.4 148.4  78.8 121.4
     97.0 117.0  54.0 123.0
030 125.0                 88.6       92.8 144.4 140.4  87.3  82.8
    104.0  89.0  68.0 163.0
031 129.0 101.0           92.6       127.4 149.4 150.4  97.8  88.8
    105.0 114.0  72.0 175.0
032 139.0 107.0 159.3 109.1  87.6 139.4 156.4 158.4  99.8 129.4
```

Figure 41. Sample Printout of Simulated Tasks Data File

TABLE 20

STRUCTURE OF ANTHROPOMETRY DATA FILE

Field	Content
1-3	Subject Number
5-9	Height
11-15	Weight
17-21	Sitting Height
23-27	Effective Reach

001	164.5	138.5	87.0	73.4
002	168.2	148.5	84.0	79.0
003	165.0	140.5	84.0	73.0
004	168.2	148.5	84.0	78.0
005	167.0	153.5	90.4	75.1
006	171.6	155.0	91.4	82.4
007	180.8	151.5	94.1	75.6
008	167.2	142.5	84.9	78.6
009	177.2	168.0	91.3	87.2
010	185.4	154.0	94.0	82.0
011	179.2	178.5	95.5	78.2
012	181.0	170.9	90.0	82.0
013	196.0	200.5	101.2	82.6
014	179.4	159.4	92.0	78.6
015	159.2	155.5	88.4	72.0
016	175.4	164.5	93.0	76.4
017	194.0	224.5	95.0	87.2
018	198.0	179.5	88.0	77.0
019	187.0	174.0	82.0	96.2
020	173.0	181.0	89.0	74.0
021	163.8	151.5	87.5	71.6
022	170.0	137.0	89.2	73.0
023	170.0	142.0	89.2	
024	163.4	134.0	85.8	70.2
025	173.0	179.0	94.0	74.0
026	161.4	174.0	88.5	72.2
027	181.6	225.0	84.6	99.8
028	185.0	193.0	93.4	81.0
029	176.0	158.5	91.7	72.0
030	174.0	171.0	91.5	71.0
031	186.8	193.0	98.6	70.6
032	193.4	180.0	79.0	93.0
033	163.2	137.5	80.6	70.0
034	172.8	152.5	75.6	87.5
035	174.2	214.0	94.0	72.0
036	171.2	165.5	92.8	
037	189.8	167.5	75.2	94.2
038	176.0	203.0	89.8	71.0
039	174.0	179.0	90.5	70.0
040	182.0	155.5	90.2	73.0
041	180.0	174.5	94.2	74.6

Figure 42. Sample Printout of Anthropometry Data File

TABLE 21

SUBJECT ANTHROPOMETRIC DATA SUMMARY

Anthropometric Measure	Mean	Std. Dev.	Max Value	Min Value
Males				
Ht. (cm)	176.9	7.0	209.5	158.2
Wt. (lbs)	168.5	23.4	234.1	109.5
Sitting Ht. (cm)	91.2	4.3	101.2	70.8
Functional Reach (cm)	77.7	5.3	99.8	63.0
Females				
Ht. (cm)	164.6	6.4	180.3	148.0
Wt. (lbs)	137.0	17.5	185.5	87.1
Sitting Ht. (cm)	86.3	3.4	94.8	77.8
Functional Reach (cm)	70.8	4.5	85.1	61.5

TABLE 22

CANDIDATE TEST PERFORMANCE DATA SUMMARY

Candidate Test	Mean	Std. Dev.	Max.	Min.
Males				
X1 Max 6' Lift (lbs)	119.6	21.3	190	70
X2 Elbow Lift (lbs)	153.7	28.7	200	80
X3 70 lb Elbow Ht. Hold (sec)	38.8	16.8	178.2	3.2
X7 Knuckle Ht. Lift (lbs)	188.5	20.5	200	70
X9 38 cm Vertical Lift (lbs)	253.6	63.7	433	69
X10 Elbow Ht. Vertical Lift (lbs)	91.3	21.0	173	34
P9 1 Hand Pull (lbs)	139.4	31.2	336	45
X8 1 Hand Grip Strength (lbs)	100.9	18.6	162.8	57.2
Females				
X1 Max 6' Lift (lbs)	55.6	8.9	70	40
X2 Elbow Ht. Lift (lbs)	81.2	16.8	130	40
X3 70 lb Elbow Ht. Hold (sec)	5.7	6.9	40.2	0
X7 Knuckle Ht. Lift (lbs)	110.7	22.5	170	70
X9 38 cm Vertical Lift (lbs)	130.1	40.0	245	37
X10 Elbow Ht. Vertical Lift (lbs)	48.2	13.1	87	23
P9 1 Hand Pull (lbs)	79.1	21.9	143	34
X8 1 Hand Grip Strength (lbs)	65.3	10.0	85.8	28.6

TABLE 23

CANDIDATE TEST PERFORMANCE DATA COMPOSITE

Candidate Test	Mean	Std. Dev.	Max.	Min.
X1 Max 6' Lift (lbs)	110.0	30.3	190	40
X2 Elbow Lift (lbs)	142.6	37.7	200	40
X3 70 lb Elbow Ht. Hold (sec)	33.8	19.7	178.2	0
X7 Knuckle Ht. Lift (lbs)	176.9	34.7	200	70
X9 38 cm Vertical Lift (lbs)	234.6	75.3	433	37
X10 Elbow Ht. Vertical Lift (lbs)	84.7	25.3	173	23
P9 1 Hand Pull (lbs)	130.1	37.1	336	34
X8 1 Hand Grip Strength (lbs)	95.5	21.7	162.8	28.6

TABLE 24

SIMULATED TASK PERFORMANCE DATA

Candidate Test	Mean	Std. Dev.	Max.	Min.
Males				
H3 H/P Shoulder Ht (lbs)	112.7	23.7	206.0	60.0
H4 H/P Reach Ht (lbs)	105.8	21.1	176.0	56.7
L2 Lift Tool Box to WB (lbs)	90.3	17.5	183.9	47.5
L6 Lift F-K (lbs)	152.3	36.4	252.0	75.9
L7 Lift F-WB (lbs)	136.2	36.8	351.4	58.7
L8 Lift F-S (lbs)	76.6	14.2	110.4	42.9
L9 Lift F-6' (lbs)	62.4	13.4	133.7	30.9
C2 Tool Box Carry (lbs)	110.5	22.4	180.9	56.5
C3 Side Carry (lbs)	117.7	27.6	212.4	60.6
C4 Front Carry (lbs)	131.8	35.0	320.9	50.7
P1 Low Push (lbs)	83.3	19.9	151.0	39.0
P2 Low Pull (lbs)	100.7	20.1	158.0	53.0
P3 High Push (lbs)	58.2	14.2	97.0	24.0
Females				
H3 H/P Shoulder Ht (lbs)	54.5	9.8	79.0	24.7
H4 H/P Reach Ht (lbs)	56.0	13.0	95.1	32.7
L2 Lift Tool Box to WB (lbs)	46.5	9.8	71.1	23.2
L6 Lift F-K (lbs)	72.5	15.6	122.5	29.1
L7 Lift F-WB (lbs)	68.2	17.6	124.2	31.2
L8 Lift F-S (lbs)	41.4	8.1	63.1	22.2
L9 Lift F-6' (lbs)	30.5	8.1	52.1	13.2
C2 Tool Box Carry (lbs)	60.9	12.0	95.3	33.8
C3 Side Carry (lbs)	58.7	13.0	91.1	28.6
C4 Front Carry (lbs)	67.0	16.7	107.9	30.8
P1 Low Push (lbs)	57.6	13.5	94.0	23.0
P2 Low Pull (lbs)	67.4	14.6	102.0	39.0
P3 High Push (lbs)	40.9	12.2	74.0	18.0

TABLE 25

SIMULATED TASK PERFORMANCE DATA (COMPOSITE)

Candidate Test	Mean	Std. Dev.	Max.	Min.
H3 H/P Shoulder Ht (lbs)	103.3	30.8	206.0	24.7
H4 H/P Reach Ht (lbs)	99.5	26.2	176.0	32.7
L2 Lift Tool Box to WB (lbs)	83.6	22.8	183.9	23.2
L6 Lift F-K (lbs)	139.7	44.8	252.0	29.1
L7 Lift F-WB (lbs)	125.8	42.4	351.4	31.2
L8 Lift F-S (lbs)	71.4	18.4	110.4	22.2
L9 Lift F-6' (lbs)	58.0	16.9	133.7	13.2
C2 Tool Box Carry (lbs)	103.2	27.6	180.9	33.8
C3 Side Carry (lbs)	108.5	33.5	212.4	28.6
C4 Front Carry (lbs)	121.8	40.3	320.9	30.8
P1 Low Push (lbs)	79.3	21.2	151.0	23.0
P2 Low Pull (lbs)	95.5	22.8	158.0	39.0
P3 High Push (lbs)	55.5	15.3	97.0	18.0

dependent variables and the 8 machine tests as independent variables it was observed from a preliminary analysis of the data that there were suspect points, or outliers, in the data file. Since there were several simulated task responses corresponding to each value of, a machine test (e.g. X1; six foot lift), standard tests for outliers were used and points that were deemed outliers were omitted from the analyses. The data used in arriving at the prediction equations did not include the outliers. The statistical basis for the outlier procedures followed those recommended by Tietgen and Moore (1972) and Barnett and Lewis (1978).

After the elimination of outliers from the data file a stepwise regression analysis was performed (SAS subroutine, STEPWISE) to determine the machine variables to be used in predicting simulated task variable values. Table (26) summarizes the results of the regression analysis. Examination of Table (26) shows that the candidate test X1 (6 foot incremental lift) was the first variable to enter the regression for most of the simulated tasks. If a single variable model were to be used, then that model should be based on X1. If a multiple variable model is to be used, then such a model should be based on the additional candidate tests X3 (70 pound elbow hold), X7 (knuckle height lift), and X11 (one hand pull), as they were the variables to enter the regression in relatively early positions.

For a single variable model based on the candidate test X1, scatter plots of the data, that is, of each of the dependent variables vs. X1, revealed a lack of homoscedasticity in the data. That is, the variance of the dependent variable for a given value of X1 was not constant across all values of X1. This suggests a weighted regression. A weighting scheme which is often used is to assume the variance of the dependent variable, given X1, if proportional to $(X1)^2$. Thus a potential weighting scheme was examined using weight = $w_i = (1/(X1_i))^2$. Since there were several (and in some instances many) values of the dependent variable for each value of X1, another weighting scheme was explored using $w_i = 1/s^2_i$, where s^2_i is the variance of the dependent variable for a fixed value of X1. An analysis of the coefficients of determination (R^2 of the weighted and nonweighted regression lines revealed highest R^2 values for the $1/s_i$ weighting scheme.

Table 27 shows the resulting best single variable models of simulated task performance based on X1. Equations were also developed to predict performance on X1 given simulated task performance (see Table 28). The results of the regression analysis for two, three and four variable models are shown in Tables 29-31. Finally, a five variable model using the weight of the subject as the fifth variable is presented in Table 32. The regression equations presented in Tables 28 through 32 are not weighted, however, as the number of independent variables (test scores) increased in the regression equations, the gaines in R^2 were small.

TABLE 26

SUMMARY OF VARIABLES ENTERING STEPWISE REGRESSION

Simulated Task	Position of Candidate Test Variable Entering the Regression							
	1	2	3	4	5	6	7	8
L2	X1	X17	X10	X3	X8	X2	X9	X11
L6	X1	X7	X9	X3	X11	X10	X8	X2
L7	X1	X7	X9	X3	X11	X8	X2	X10
L8	X1	X3	X7	X9	X11	X2	X8	X10
L9	X1	X7	X10	X3	X11	X8	X2	X9
H3	X1	X9	X7	X11	X3	X10	X2	X8
H4	X1	X11	X9	X3	X7	X10	X2	X8
C2	X1	X7	X11	X3	X9	X8	X10	X2
C3	X1	X7	X3	X9	X11	X8	X2	X10
C4	X1	X9	X7	X3	X11	X10	X2	X8
P1	X1	X11	X10	X2	X7	X8	X9	X3
P2	X11	X1	X10	X2	X8	X7	X9	X3
P3	X11	X1	X10	X8	X3	X7	X2	X3

TABLE 27

ONE VARIABLE REGRESSION EQUATIONS PREDICTING SIMULATED TASK PERFORMANCE (WEIGHTED BY $1/(X1)^2$

	R^2
L2 = 0.6489 X1 + 12.7477	0.7500
L6 = 1.1797 X1 + 11.2164	0.7344
L7 = 0.9936 X1 + 16.7324	0.6433
L8 = 0.5167 X1 + 15.1135	0.7236
L9 = 0.4502 X1 + 8.2386	0.6748
H3 = 0.8356 X1 + 12.0214	0.7976
H4 = 0.7382 X1 + 17.2433	0.7420
C2 = 0.7414 X1 + 21.9944	0.7126
C3 = 0.8578 X1 + 14.9464	0.6827
C4 = 0.9692 X1 + 15.5445	0.6654
P1 = 0.3969 X1 + 35.8983	0.4340
P2 = 0.5173 X1 + 38.7013	0.5591
P3 = 0.2619 X1 + 26.8747	0.3435

where X1 = Maximum weight lifted to 6 feet on the incremental weight machine

TABLE 28

ONE VARIABLE REGRESSION EQUATIONS PREDICTING
CANDIDATE TEST X1 PERFORMANCE

	R^2
X1 = 1.0045 L2 + 25.8740	0.5852
X1 = 0.5080 L6 + 38.2961	0.5700
X1 = 0.5018 L7 + 46.7764	0.4880
X1 = 1.2036 L8 + 23.6420	0.5498
X1 = 1.2636 L9 + 37.8293	0.5034
X1 = 0.7923 C2 + 28.5053	0.5219
X1 = 0.6414 C3 + 39.9703	0.5041
X1 = 0.5328 C4 + 44.9970	0.4942
X1 = 0.7926 P1 + 46.6254	0.3003
X1 = 0.8852 P2 + 25.3880	0.4426
X1 = 1.0620 P3 + 50.7693	0.2820
X1 = 0.8205 H3 + 24.8592	0.6581
X1 = 0.8640 H4 + 25.7538	0.5971

where X1 = Maximum weight lifted to 6 feet on the incremental weight machine

TABLE 29

TWO VARIABLE REGRESSION EQUATIONS PREDICTING SIMULATED TASK PERFORMANCE

	R^2
L2 = 23.56 + 0.477 X1 + 0.228 X3	0.6043
L6 = 25.483 + 0.92 X1 + 0.423 X3	0.5849
L7 = 28.186 + 0.742 X1 + 0.48 X3	0.5057
L8 = 25.17 + 0.353 X1 + 0.226 X3	0.5782
L9 = 16.456 + 0.333 X1 + 0.137 X3	0.5069
C2 = 36.046 + 0.51 X1 + 0.324 X3	0.5446
C3 = 29.452 + 0.601 X1 + 0.391 X3	0.5285
C4 = 26.795 + 0.731 X1 + 0.437 X3	0.5160
P1 = 39.037 + 0.35 X1 + 0.061 X3	0.2983
P2 = 43.049 + 0.437 X1 + 0.129 X3	0.4478
P3 = 27.714 + 0.233 X1 + 0.077 X3	0.2921
H3 = 20.443 + 0.673 X1 + 0.274 X3	0.6712
H4 = 25.849 + 0.589 X1 + 0.228 X3	0.6127

where X1 = Maximum weight lifted to 6 feet on the incremental weight machine

X3 = Maximum time holding a 70 pound weight at elbow height

TABLE 30

THREE VARIABLE REGRESSION EQUATIONS PREDICTING SIMULATED TASK PERFORMANCE

	R^2
L2 = 8.5225 + 0.3501 X1 + 0.1744 X3 + 0.1743 X7	0.6331
L6 = -8.4903 + 0.6320 X1 + 0.2978 X3 + 0.3946 X7	0.6238
L7 = -0.0393 + 0.5067 X1 + 0.3850 X3 + 0.3243 X7	0.5351
L8 = 14.9235 + 0.2677 X1 + 0.1912 X3 + 0.1177 X7	0.5979
L9 = 8.3744 + 0.2745 X1 + 0.1095 X3 + 0.0872 X7	0.5243
H3 = 5.2454 + 0.5443 X1 + 0.2182 X3 + 0.1764 X7	0.6878
H4 = 13.6862 + 0.4952 X1 + 0.1887 X3 + 0.1342 X7	0.6244
C2 = 15.3453 + 0.3374 X1 + 0.2572 X3 + 0.2367 X7	0.5807
C3 = 7.2885 + 0.4131 X1 + 0.3149 X3 + 0.2565 X7	0.5581
C4 = -2.2188 + 0.4895 X1 + 0.3372 X3 + 0.3334 X7	0.6496
P1 = 30.4752 + 0.2749 X1 + 0.0317 X3 + 0.1008 X7	0.3087
P2 = 35.8173 + 0.3761 X1 + 0.1044 X3 + 0.0839 X7	0.4545
P3 = 23.0091 + 0.1977 X1 + 0.0594 X3 + 0.0514 X7	0.3011

where X1 = Maximum weight lifted to 6 feet on the incremental weight machine

X3 = Maximum time holding a 70 pound weight at elbow height

X7 = Maximum weight lifted to knuckle height on the incremental weight machine

TABLE 31

FOUR VARIABLE REGRESSION EQUATIONS PREDICTING SIMULATED TASK PERFORMANCE

	R^2
L2 = 7.3420 + 0.3271 X1 + 0.1613 X3 + 0.1632 X7 + 0.0471 X11	0.6361
L6 = -12.4377 + 0.5554 X1 + 0.2557 X3 + 0.3571 X7 + 0.1573 X11	0.6325
L7 = -2.8133 + 0.4501 X1 + 0.3538 X3 + 0.2993 X7 + 0.1112 X11	0.5400
L8 = 13.4020 + 0.2310 X1 + 0.1715 X3 + 0.0989 X7 + 0.0733 X11	0.6090
L9 = 7.0895 + 0.2531 X1 + 0.0973 X3 + 0.0787 X7 + 0.0426 X11	0.5290
H3 = 2.2597 + 0.4739 X1 + 0.1900 X3 + 0.1463 X7 + 0.1313 X11	0.7012
H4 = 10.2714 + 0.4236 X1 + 0.1467 X3 + 0.0943 X7 + 0.1518 X11	0.6481
C2 = 12.2678 + 0.2737 X1 + 0.2205 X3 + 0.2058 X7 + 0.1287 X11	0.5963
C3 = 4.6270 + 0.3614 X1 + 0.2875 X3 + 0.2340 X7 + 0.1019 X11	0.5646
C4 = -6.6687 + 0.4036 X1 + 0.2882 X3 + 0.2928 X7 + 0.1745 X11	0.5630
P1 = 26.5643 + 0.1994 X1 - 0.0117 X3 + 0.0671 X7 + 0.1509 X11	0.3454
P2 = 29.7067 + 0.2547 X1 + 0.0378 X3 + 0.0305 X7 + 0.2391 X11	0.5330
P3 = 19.6804 + 0.1330 X1 + 0.0241 X3 + 0.0222 X7 + 0.1292 X11	0.3522

where X1 = Maximum weight lifted to 6 feet on the incremental weight machine

X3 = Maximum time holding 70 pound weight at elbow height

X7 = Maximum weight lifted to knuckle height on the incremental weight machine

X11 = Maximum one handed static pulling strength

TABLE 32

FIVE VARIABLE REGRESSION EQUATIONS PREDICTING
SIMULATED TASK PERFORMANCE

	R^2
L2 = - 6.506 + 0.268 X1 + 0.165 X3 + 0.17 X7 + 0.032 X11 + 0.129 WT	0.6487
L6 = -21.84 + 0.514 X1 + 0.258 X3 + 0.362 X7 + 0.148 X11 + 0.087 WT	0.6342
L7 = -17.47 + 0.386 X1 + 0.356 X3 + 0.307 X7 + 0.0944 X11 + 0.137 WT	0.5441
L8 = - 0.561 + 0.167 X1 + 0.174 X3 + 0.107 X7 + 0.058 X11 + 0.131 WT	0.6283
L9 = - 4.354 + 0.203 X1 + 0.102 X3 + 0.085 X7 + 0.030 X11 + 0.105 WT	0.5452
H3 = - 6.847 + 0.434 X1 + 0.189 X3 + 0.151 X7 + 0.122 X11 + 0.085 WT	0.7042
H4 = 12.43 + 0.434 X1 + 0.144 X3 + 0.093 X7 + 0.155 X11 - 0.021 WT	0.6493
C2 = - 1.264 + 0.214 X1 + 0.223 X3 + 0.213 X7 + 0.113 X11 + 0.127 WT	0.6049
C3 = -13.551 + 0.282 X1 + 0.291 X3 + 0.242 X7 + 0.081 X11 + 0.171 WT	0.5751
C4 = -20.032 + 0.346 X1 + 0.289 X3 + 0.299 X7 + 0.160 X11 + 0.125 WT	0.5672
P1 = - 9.707 + 0.044 X1 - 0.010 X3 + 0.088 X7 + 0.111 X11 + 0.335 WT	0.4472
P2 = - 6.797 + 0.088 X1 + 0.046 X3 + 0.053 X7 + 0.200 X11 + 0.340 WT	0.6199
P3 = 2.831 + 0.059 X1 + 0.027 X3 + 0.032 X7 + 0.111 X11 + 0.155 WT	0.3936

where X1 = Maximum weight lifted to 6 feet on the incremental weight machine

X3 = Maximum time holding 70 pound weight at elbow height

X7 = Maximum weight lifted to knuckle height on the incremental weight machine

X11 = Maximum one handed static pulling strength

WT = Weight of the test subject in pounds

The linear equations in Table 28 tend to overpredict X1 test scores for the relatively less demanding activities. If such equations are used to develop the assignment criterion, there is a tendency to overestimate the demand level for the lighter AFSCs. Similarly if the regression equation in Tables 29 through 32 are used to calculate X1 test scores similar results are obtained, namely, over-prediction of X1 score and hence overprediction of the demand levels of the lighter AFSCs.

To eliminate the problems of overestimation of X1 equivalent test scores from the linear regressions equation, a set of a 2nd order regression equations were developed. These were in the form

$$X1 = a + by + cy^2$$

where: a, b, and c are constants
y = the various activities (L_2, L_6, ..., etc.)

These regression equations had a tendency to peak at the higher values of the activities, and hence resulted in underestimation of the higher values of X1 test score. To avoid this, a set of nonlinear equations were developed in the form:

$$X1 = a + b\sqrt{y}$$

where: a, b are constants
y = the various activities (L_2, L_6, ... etc.).

The set of equations are presented in Table 33 along with their respective R^2 values. These equations seem to estimate X1 equivalent score adequately for the higher and well as the lower ranges of the activities.

To improve the regression equations for push/pull activities a different set of equations were utilized which significantly improved the R^2 for P1 and P2 activities. These are linear regression equations which considered the body weight of the airman (W_T), since the body weight alone generates a significant component of the push/pull force. These equations are shown in Table 34.

G. MEPS SCHEDULE ANALYSES

The schedule of the Military Enlistment Processing Station (MEPS) were analyzed to determine possible schedules for accommodating the Strength Aptitude Tests. Project team members experienced in sequencing, scheduling and workplace design visited MEPS installations in San Antonio and Chicago. Observations of the flow of recruits through the various testing and other procedures indicated that enough time would be available for incorporating the Strength Aptitude Tests without creating significant delays in the processing of personnel.

TABLE 33

REGRESSION EQUATIONS USED TO CALCULATE X1
EQUIVALENT FOR VARIOUS ACTIVITIES

	R^2
$X1 = -53.8355 + 18.0828\sqrt{L2}$	0.6130
$X1 = -31.6481 + 12.0823\sqrt{L6}$	0.6030
$X1 = -17.2840 + 11.5058\sqrt{L7}$	0.5226
$X1 = -56.9299 + 19.8865\sqrt{L8}$	0.5740
$X1 = -31.2656 + 18.9131\sqrt{L9}$	0.5316
$X1 = -50.6618 + 15.9915\sqrt{C2}$	0.5455
$X1 = -27.0953 + 13.3748\sqrt{C3}$	0.5361
$X1 = -20.1369 + 11.9497\sqrt{C4}$	0.5282
$X1 = -55.2871 + 16.4156\sqrt{H3}$	0.6850
$X1 = -55.6685 + 16.9386\sqrt{H4}$	0.6210

where:

L2 = LIFT TOOL BOX F-WB (1 HAND)
L6 = LIFT REGULAR BOX F-K
L7 = LIFT REGULAR BOX F-WB
L8 = LIFT REGULAR BOX F-S
L9 = LIFT REGULAR BOX F-6 FT (F-R)
H3 = H/P SHOULDER LEVEL
H4 = H/P REACH LEVEL

C2 = 1 HAND TOOL BOX CARRY
C3 = 2 HAND SIDE CARRY
C4 = 2 HAND FRONT CARRY
P1 = LOW LEVEL PUSH
P2 = LOW LEVEL PULL
P3 = UPPER LEVEL PUSH
X1 = 6' INCREMENTAL LIFT

TABLE 34

REGRESSION EQUATIONS FOR PUSH/PULL ACTIVITIES

	R^2
X1 = - 9.396 + 0.404P1 + 0.531WT	0.424
X1 = - 9.330 + 0.606P2 + 0.374WT	0.495
X1 = -14.205 + 0.607P3 + 0.551WT	0.442

Although procedures may vary among MEPS if more than one test is required a suggested sequence for performing the Strength Aptitude Tests is as follows:

Test	Average Test Time
1. X1 - 6' Lift	1.5 min
2. X7 - Knuckle Height Lift	
3. X11 - One Hand Pull	15 sec
Break: Go to another activity	
4. X3 - 70 lb. Elbow Height Hold	32.5 sec

The above times are average times using experienced personnel. It is doubtful that for any two tests, total time needed would exceed three minutes/enlistee. It is advisable to have two lines for testing to reduce the effects of fatigue on test results. Using two lines for two tests would cut down real time for the tests and maintain good flow of recruits through the testing stations.

The recommended assignment criterion is based on only one test, the incremental 6 foot lift, X1. However, should more tests be needed to modify the assignment criterion, the above times can be used as a guide.

IV. PHASE III. DEFINING EQUIPMENT FOR STRENGTH/STAMINA APTITUDE TESTS AND TASK MEASUREMENT

A. EQUIPMENT FOR MEASUREMENT OF TASK DEMANDS (PHASE I)

A summary of the equipment used for the measurement of task demands (Phase I) is presented in Table 35. The load cells and accompanying readout units are shown in Figure 43. No foreseeable hazards were associated with the use of this equipment.

B. EQUIPMENT FOR MEASUREMENT OF HUMAN CAPACITIES (PHASE II)

A summary of the equipment used for the measurement of human capacities (Phase II) is presented in Table 36. The load cells and readout units are shown in Figure 43. The push-pull platform is shown in Figure 44. The push-pull platform was designed for the performance of candidate tests X9, X10, and X11. The X factor strength test machine is shown in Figure 45, and was used to perform candidate tests X1, X2, X3, and X7. The hand dynamometer is presented in Figure 46, and was used to perform candidate test X8.

The primary hazard associated with the use of this equipment was that of musculoskeletal injuries (specifically muscle strains and sprains). These hazards were counteracted through the use of medical screening and performance of the candidate tests in the manner described in the test instructions.

TABLE 35

EQUIPMENT USED FOR MEASUREMENT OF TASK DEMANDS

Equipment	Intended Use	Purchased or Manufactured	Source (if purchased and not generally available)
1. Load cells (Model CA 1000) and digital readout units (Model HSC-11)	Determine forces required to lift, push, pull various equipment/objects under AFSC job requirements	Purchased	AMETEK Controls Div. Feasterville,PA 19047
2. Hooks, couplers chains, nylon straps	Used to attach load cell to equipment/object being measured	Purchased	Generally available

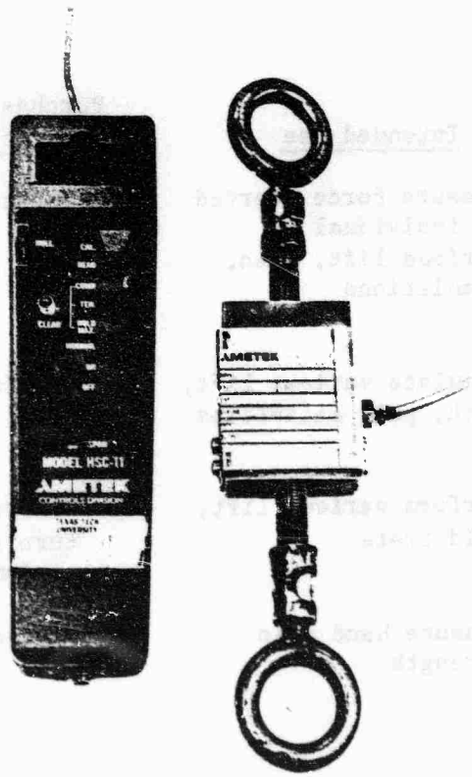


Figure 43. Load Cell and Readout Unit

TABLE 36

EQUIPMENT USED FOR MEASUREMENT OF HUMAN CAPACITIES

Equipment	Intended Use	Purchased or Manufactured	Source (if purchased and not generally available)
1. Load cells (Models CA 1000) and digital read-out units (Model HSC-11)	Measure force exerted by individual in various lift, push, simulations	Purchased	AMETEK Controls Div. Feasterville, PA 19047
2. Push-pull platform will accessories	Simulate various lift, push, pull activities	Manufactured	
3. X factor strength test machine	Perform various lift, hold tests	Government furnished equipment	
4. Hand dynamometer (Model #78010)	Measure hand grip strength	Purchased	Lafayette Instrument Co. Lafayette, IN 47902

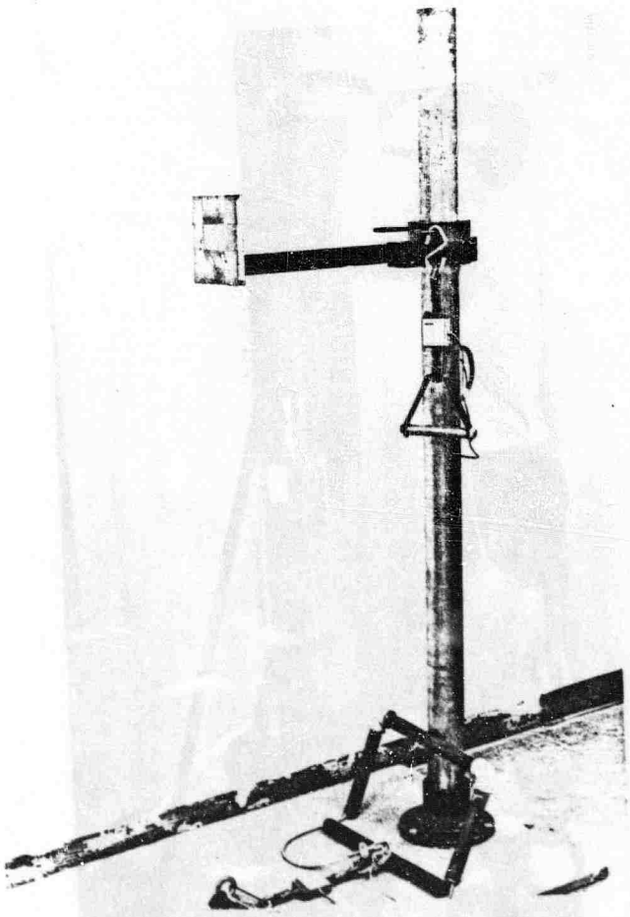


Figure 44. Push-Pull Platform for Performance of Candidate Tests X9, X10, and X11.

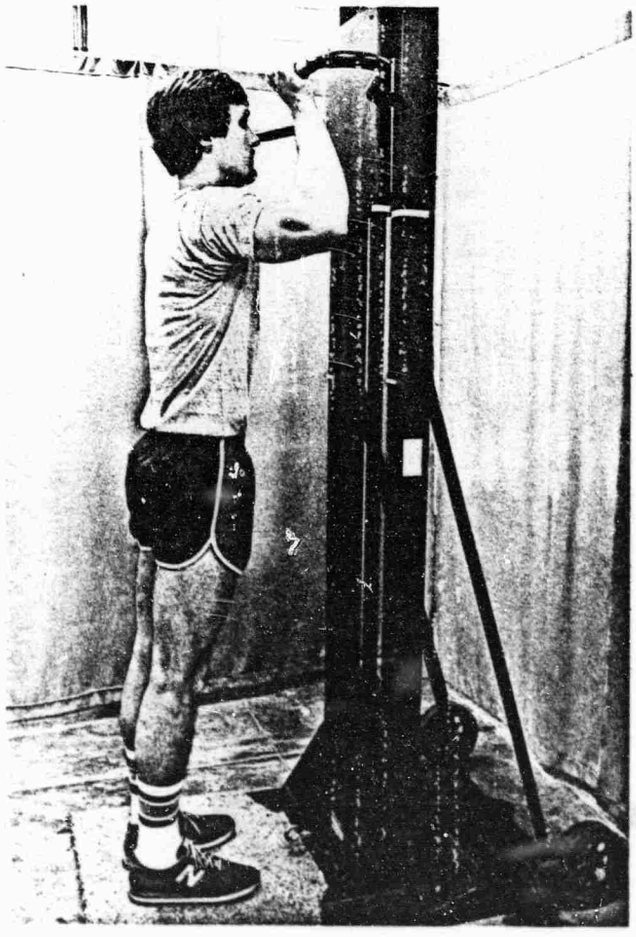


Figure 45. X-Factor Strength Test Machine for Performance of Candidate Tests X1, X2, X3, and X7 (X1 shown above).

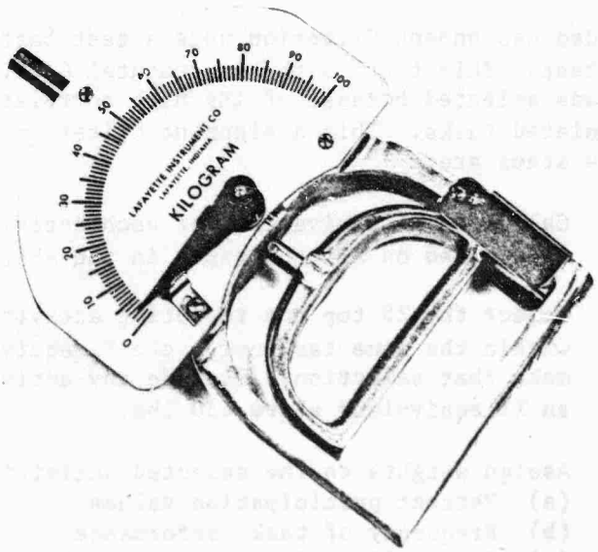


Figure 46. Hand Dynamometer for Performance of Candidate Test X8.

V PHASE IV. FINALIZATION OF THE ASSIGNMENT CRITERION

In order to develop a procedure to assign personnel to demanding tasks, several factors must be considered. These are:

(A) The assignment criterion must be as simple as possible.
(B) The assignment criterion should be such that it would minimize type 1 and type 2 errors.

An assignment criterion can be developed using a test battery composed of more than one test. A small test battery composed of one or two tests would be less time consuming, easier to administer, and hence less costly. The recommended assignment criterion described below considered several tests, however, one test only was considered because the inclusion of additional tests did not seem to improve the predictive equations which were used as the basis of the assignment criterion.

The Assignment Criterion

The recommended Assignment Criterion uses a test battery composed of a single test. This test is the incremental 6 ft. lift, (X1). The X1 test was selected because of its high correlation with performance on simulated tasks. This assignment criterion has several steps. These steps are:

Step (1) Calculate X1 equivalent for each activity for an AFSC based on all the tasks in the AFSC.

Step (2) Select the 25 top non repeating activities and objects within the same task using the X1 equivalent score to make that selection. Exclude any activities which have an X1 equivalent above 150 lbs.

Step (3) Assign weights to the selected activities based on:
(a) Percent participation values
(b) Frequency of task performance
(c) Criticality of the task.

Step (4) Calculate the AFSC demand score which is taken as the weighted average for the X1 values for the top 25 activities.

Step (5) Adjust the AFSC demand score base on number of airmen requested for the AFSC.

The assignment criterion as briefly outlined in the above steps is based on the most demanding 25 activities subjects to the following constraints:

(a) No repeated simulated tasks and objects handled for a given task. This means that for task A, say, L2 and object 2 combination cannot be repeated. However, this same combination can be repeated for other tasks.

(b) Tasks which have a yearly or semi-annual frequency of performance are not considered in development of the AFSC demand score. This will avoid having very infrequently performed tasks control the demand score of the AFSC, especially when the majority of the demanding tasks are performed yearly.

(c) Any activity which has an equivalent X1 value greater than 150 lbs. is not considered in the development of the AFSC demand score. The rationale is that such activities exceed the 75% percentile of the male population and thus considered candidates for further analysis and study to reduce their demand.

(d) Certain AFSCs because of their physically demanding nature have been exempt from constraints (a), (b), and (c) above. These AFSCs are:

Pararescue/Recovery	115X0	Law Enforcement	811X2
Survival	121X0	Medical Services	902X0
Fire Protection	571X0		

The following section discusses the steps for the assignment criterion in detail:

Step (1) Calculate X1 equivalent for each activity for an AFSC:

The Assignment Criterion utilizes a single test score, namely, the incremental 6 foot lift (X1). Because (X1) is the best single test to predict an airman's ability to perform the simulated tasks (see phase II), it was selected as the basis for the Assignment Criterion. As a dynamic strength test (X1) reinforced previous results by Aghazadeh (1982) and Pytel and Kamon (1981) who reported that dynamic tests were better predictor of lifting ability as compared to static strength tests.

To apply this assignment criterion, the most demanding 25 activities were selected from the AFSC tasks. Activities here refer to:

1. Lift/Lower
2. Push/Pull
3. Carry
4. Hold and position

The selection of these top 25 activities are accomplished by calculating the X1 equivalent for each of the activities in the AFSC. Table 37 gives the regression equations used to calculate the X1 equivalent values.

TABLE 37

REGRESSION EQUATIONS USED TO CALCULATE X1 EQUIVALENT FOR VARIOUS ACTIVITIES

		R^2
L2	$X1 = -53.8355 + 18.0828 \sqrt{L2}$	0.6130
L6	$X1 = -31.6481 + 12.0823 \sqrt{L6}$	0.6030
L7	$X1 = -17.2840 + 11.5058 \sqrt{L7}$	0.5226
L8	$X1 = -56.9299 + 19.8865 \sqrt{L8}$	0.5740
L9	$X1 = -31.2656 + 18.9131 \sqrt{L9}$	0.5316
C2	$X1 = -50.6618 + 15.9915 \sqrt{C2}$	0.5455
C3	$X1 = -27.9953 + 13.3748 \sqrt{C3}$	0.5361
C4	$X1 = -20.1369 + 11.9497 \sqrt{C4}$	0.5282
H3	$X1 = -55.2871 + 16.4156 \sqrt{H3}$	0.6850
H4	$X1 = -55.6685 + 16.9386 \sqrt{H4}$	0.6210
P1	$X1 = -9.396 + 0.404P1 + 0.531WT$	0.424
P2	$X1 = -9.330 + 0.606P2 + 0.374WT$	0.495
P3	$X1 = -14.205 + 0.607P3 + 0.551WT$	0.442

where:

L2 = LIFT TOOL BOX F-WB (1 HAND)
L6 = LIFT REGULAR BOX F-K
L7 = LIFT REGULAR BOX F-WB
L8 = LIFT REGULAR BOX F-S
L9 = LIFT REGULAR BOX F-6 FT (F-R)
H3 = H/P SHOULDER LEVEL
H4 = H/P REACH LEVEL
C2 = 1 HAND TOOL BOX CARRY
C3 = 2 HAND SIDE CARRY
C4 = 2 HAND FRONT CARRY
P1 = LOW LEVEL PUSH
P2 = LOW LEVEL PULL
P3 = UPPER LEVEL PUSH
X1 = 6' INCREMENTAL LIFT
Wt = BODY WEIGHT

Step (2) Select the 25 top non-repeating activities and objects

Based on the values for X1, the top 25 activities in terms of their demands are identified. These 25 activities may be activities which belong to any number of tasks, i.e., some tasks may have more than one activity in the top 25. At the same time there may be more of one activity compared to another in the top 25 activities, i.e., there may be more Lift/Lower activities than Push/Pull or hold, ..., etc. The X1 equivalent must not exceed 150 lbs.

Step (3) Assign weights to selected activities

Each task within an AFSC is given different weights based on three different factors. These weights in effect establish the task's importance for inclusion in the calculation of the AFSC demand score. The factors considered here were:

1. percent participation,
2. frequency of performance, and
3. criticality.

The weight assignment schemes for each of these factors is discussed in the sections below.

For percent participation a weighting scheme is developed where the tasks percent participation value in a given AFSC is assigned as its weight value. For example if a task is performed by 65% of the incumbent, then the assigned weight is .65, i.e.:

$$\text{Assigned weight } (W_p) = \text{(percent participation/100)}$$

where

(W_p) = Assigned weight for percent participation

Any activity performed under a task is given the same percent participation weight given to that task.

For frequency of performance, a weighting scheme was developed where a task performed daily would be given a higher weight than a task performed weekly, monthly, quarterly, semi-annually, or annually. The following Table 38 gives the assigned weights. Simiarly, any activity performed under a task is given the same frequency weight given to that task.

For criticality, a linear weighting scheme is recommended, i.e., a straight line relationship is recommended. This relationship is:

TABLE 38

WEIGHTS ASSIGNED FOR FREQUENCY OF TASK PERFORMANCE

Frequency of Performance	Weight Assigned W_f
D - Daily	365/365 = 1.0000
W - Weekly	52/365 = 0.1425
M - Monthly	12/365 = 0.0329
Q - Quarterly	3/365 = 0.0082
S - Semi Annually*	2/365 = 0.0055
A - Annually*	1/365 = 0.0027

*Not utilized in the recommended assignment criterion

$$\text{Weight Assigned } (W_T) = .5 + \frac{3.0 - .5}{X_2 - X_1} \quad [X]$$

where

W_T = Assigned weight for criticality of magnitude X

.5 = Assigned weight for the smallest training emphasis value for an AFSC

3.0 = Assigned weight for the highest training emphasis value for an AFSC

X_2 = Largest training emphasis value

X_1 = Smallest training emphasis value

No criticality weight was utilized in the recommended assignment criterion because data on criticality were not available.

Step (4) Calculate AFSC demand score

The AFSC demand score is calculated using the weighted average X1 values for the selected top 25 tasks. This weighted average is considered to be the demand level of the AFSC translated in terms of X1, the incremental 6 foot lift.

$$\text{AFSC demand score (the Average Weighted (X1))} = \frac{\sum_{i=1}^{n} X1_i[W_i]}{\sum_{1=1}^{n} W_i}$$

where

$X1_i$ = The X1 values for activity i

W_i = The average Weight for activity i, $W_i = (W_p+W_T+W_f)/3$

n = 1, 2, ... i, 25 the number of activities selected. Occasionally the value n was less than 25 because not enough activities were available.

Step (5) Adjust the AFSC demand score

In step 4, the demand score for an AFSC is determined. This demand score represents the weighted average X1 value based on the heaviest 25 activities. Because each AFSC varies in size, and because the size of an AFSC implies the availability of airmen to assist in some demanding activities, the AFSC demand score is adjusted based on the size of the AFSC. The AFSC demand score is reduced in direct proportion to the size of the AFSC according to the following relationship.

$$\text{AFSC adjusted demand scores} = \text{demand level}\left(1 - \frac{S}{T}\right)$$

where:

S = AFSC size based on number requested.

T = Total number of airmen requested for all AFSCs. The value T is considered to be 67,500 airmen.

Both S and T are subject to change as changes in requirements vary over time. Table 39 shows the value S used for the various AFSCs.

Example Application of the Assignment Criterion

Table 40 shows a printout for 2 AFSCs, 552X0 and 423X4. The printout shows several columns of information. These columns are:

Column #	Information contained in column
1	OBS - observation no. generated by the program
2	KNO - is the K no. for the AFSC
3	LNO - this reflects the line no. in the data files containing this information
4	ACTIV - this is the activity such as LFS (lift-floor-to shoulder), CAR (Carry) ...., etc.
5	FORCE - Force requirements of the activity in lbs.
6	OBJECT - description of the object being handled
7	F - either an E or A is entered. If an E is entered, this means that the force requirements is an estimate. However, an A means that the force requirements given is an actual

TABLE 39

THE NUMBER OF AIRMEN REQUESTED (S)
FOR THE VARIOUS AFSCs

AFSC	S	AFSC	S	AFSC	S
111X0	644	328X4	1550	542X2	2342
112X0	945	341X4	788	545X0	1862
114X0	2254	341X7	110	545X2	1683
121X0	278	361X0	816	551X0	2076
122X0	2232	361X1	909	551X1	2005
231X1	720	362X4	997	552X1	403
242X0	658	392X0	2154	552X2	801
251X0	2828	404X1	432	552X4	563
275X0	686	423X0	3346	552X5	1539
293X3	1609	423X1	2259	553X0	1214
302X0	715	423X2	1164	566X0	402
303X1	925	423X3	2291	566X1	1115
303X2	948	423X4	3402	571X0	5452
304X0	2591	423X5	7284	602X0	1038
304X1	1151	426X2	10386	603X0	5437
304X4	4544	427X0	800	605X0	1057
306X0	2052	427X1	1588	605X1	3221
306X2	1411	427X3	1098	611X0	1564
307X0	2046	427X4	584	622X1	629
316X2	350	427X5	3316	631X0	6328
316X2T	91	431X0	1154	645X1	7509
321X2	217	431X1	19627	791X1	298
322X2	1092	431X2	18203	811X0	21913
322X2C	242	443X0E	240	902X0	7936
324X0	2100	443X0P	1700	902X2	1048
325X1	2077	445X0G	740	903X0	788
326X4	286	461X0	6512	905X0	758
326X6	247	462X0	7957	907X0	819
326X7	190	464X0	872	908X0	789
326X8	225	472X1	1587	913X0	255
328X0	2135	472X2	1440	914X1	273
328X1	2441	472X3	331	915X0	1191
328X3	3177	542X1	853		

TABLE 40
PRINTOUT OF ASSIGNMENT CRITERION

AFSC=423X4

OBS	KNO	LNO	ACTIV	FORCE	OBJECT	F	PERC	FREQ	SMTSK	TASK	X1
1	074	21	HPS	138	SHOCK STRUTS, ENTIRE TRUCK, C-141	E	75	W	H3	C	137.552
2	074	10	CAR	149	LANDING GEAR SHOCK STRUTS, F-4	A	34	M	C3	B	135.265
3	074	137	LFR	67	FLAP PACK, C-141 W/CRATE	A	43	M	L9	O	123.545
4	074	11	LFW	149	LANDING GEAR SHOCK STPUTS, F-4	A	34	M	L7	B	120.162
5	074	9	LFK	149	LANDING GEAR SHOCK STRUTS, F-4	A	34	M	L6	B	115.835
6	074	130	LFR	60	C-141 RUDDER PACK, IN BOX	A	81	M	L9	M	115.235
7	074	48	CAR	121	BRAKE ASS. C-141 IN CRATE	A	61	O	C4	E	111.310
8	074	22	LFK	138	SHOCK STRUTS, ENTIRE TRUCK, C-141	E	75	W	L6	C	110.286
9	074	47	LKW	121	BRAKE ASS. C-141 IN CRATE	A	61	O	L7	E	109.279
10	074	103	LFW	120	HORIZTL. STABILIZER ACT., F-111	E	47	M	L7	K	108.755
11	074	28	CAR	104	C-141 BRAKE ASSEMBLY	A	44	W	C3	O	108.401
12	074	83	LFR	52	C-141 AILERON PACK	A	60	M	L9	I	105.119
13	074	124	LFS	60	RUDDER ACTUATOR, C-9	A	81	M	L8	M	97.111
14	074	179	CAR	86	SPOILER PACK W/CRATE, C-141	A	.	M	C3	Z1	96.037
15	074	35	LFK	104	C-141 BRAKE ASSEMBLIES	A	44	W	L6	O	91.567
16	074	126	LFR	42	RUDDER POWER UNIT/PACK W/CRATE	A	81	M	L9	M	91.305
17	074	29	LFK	100	C-9 BRAKE ASSEMBLIES	E	44	W	L6	O	89.175
18	074	129	LFR	40	C-141 RUDDER PACK	E	81	M	L9	M	88.351
19	074	32	CAR	75	F-4 BRAKE ASSEMBLIES	E	44	W	C3	O	87.834
20	074	138	HPR	67	FLAP PACK, C-141 W/CRATE	A	43	M	H4	O	82.980
21	074	89	CAR	74	BRAKE PLATE, F-5	A	61	W	C4	J	82.659
22	074	67	LFR	35	C-5 ACUT., ROT./CROSS WING POS.	E	74	M	L9	G	80.626
23	074	34	LFK	86	B-52 BRAKE ASSEMBLIES	A	44	W	L6	O	80.358
24	074	139	CAR	67	FLAP PACK, C-141 W/CRATE	A	43	M	C4	O	77.676
25	074	79	LFS	45	AILERON ACTUATING CYLINDER, F-4	A	60	M	L8	I	76.473

OBS	WTP	WTF	WTAVG2	PWT	PF	PX1	SIZE	ADJ	AVGX1	RANK	ADJX1
1	0.75	0.13699	0.443493	0.0516319	7.1252	7.1021	3402	0.9496	101.683	1	96.5586
2	0.34	0.03288	0.186438	0.0217053	3.2341	2.9360	3402	0.9496	101.683	2	96.5586
3	0.43	0.03288	0.231438	0.0269443	1.8053	3.3288	3402	0.9496	101.683	3	96.5586
4	0.34	0.03288	0.186438	0.0217053	3.2341	2.6733	3402	0.9496	101.683	4	96.5586
5	0.34	0.03288	0.186438	0.0217053	3.2341	2.5142	3402	0.9496	101.683	5	96.5586
6	0.81	0.03288	0.421438	0.0490642	2.9439	5.6539	3402	0.9496	101.683	6	96.5586
7	0.61	1.00300	0.805000	0.0937189	11.3400	10.4319	3402	0.9496	101.683	7	96.5586
8	0.75	0.13699	0.443493	0.0516319	7.1252	5.6943	3402	0.9496	101.683	8	96.5586
9	0.61	1.00300	0.805000	0.0937189	11.3400	10.2415	3402	0.9496	101.683	9	96.5586
10	0.47	0.03288	0.251438	0.0292727	3.5127	3.1836	3402	0.9496	101.683	10	96.5586
11	0.44	0.13699	0.288493	0.0335866	3.4930	3.6408	3402	[illegible]	101.683	11	96.5586
12	0.60	0.03288	0.316438	0.0368400	1.9157	3.8726	3402	[illegible]	101.683	12	96.5586
13	0.81	0.03288	0.421438	0.0490642	2.9439	4.7647	3402	0.9496	101.683	13	96.5586
14	0.10	0.03288	0.066438	0.0077348	0.6652	0.7428	3402	0.9496	101.683	14	96.5586
15	0.44	0.13699	0.288493	0.0335866	3.4930	3.0754	3402	0.9496	101.683	15	96.5586
16	0.81	0.03288	0.421438	0.0490642	2.0607	4.4798	3402	0.9496	101.683	16	96.5586
17	0.44	0.13699	0.288493	0.0335866	3.3587	2.9951	3402	0.9496	101.683	17	96.5586
18	0.81	0.03288	0.421438	0.0490642	1.9626	4.3349	3402	0.9496	101.683	18	96.5586
19	0.44	0.13699	0.288493	0.0335866	2.5190	2.9500	3402	0.9496	101.683	19	96.5586
20	0.43	0.03288	0.231438	0.0269443	1.8053	2.2358	3402	0.9496	101.683	20	96.5586
21	0.61	0.13699	0.373493	0.0434824	3.2177	3.5942	3402	0.9496	101.683	21	96.5586
22	0.74	0.03288	0.386438	0.0449895	1.5746	3.6273	3402	0.9496	101.683	22	96.5586
23	0.44	0.13699	0.288493	0.0335866	2.8885	2.7003	3402	0.9496	101.683	23	96.5586
24	0.43	0.03288	0.231438	0.0269443	1.8053	2.0929	3402	0.9496	101.683	24	96.5586
25	0.60	0.03288	0.316438	0.0368400	1.6578	2.9173	3402	0.9496	101.683	25	96.5586

TABLE 40 (Continued)
PRINTOUT OF ASSIGNMENT CRITERION

AFSC=552X0

OBS	KNO	LNO	ACTIV	FORCE	OBJECT	F	PERC	FREQ	SMTSK	TASK	XI
26	036	153	LFR	83	REPLACE TRUSSES 24'	E	22	M	L9	M	141.041
27	036	169	LFR	79	WALL FRAME	A	30	Q	L9	P	136.838
28	036	128	LFR	75	8'X12' FRAME	E	42	M	L9	K	132.527
29	036	89	LFS	90	ROOFING ROLL (STANDARD)	A	57	D	L8	H	131.730
30	036	91	LFS	80	BUNDLE OF ASPHALT SHINGLES	A	57	D	L8	H	120.941
31	036	218	LFR	60	CEILING JOIST	E	41	Q	L9	Y	115.235
32	036	1	LXX	68	PILES, ON DOCKS OR WHARVES	E	6	*	L8	A	107.059
33	036	122	LKR	50	FRAME WALL &LIFT INTO PLACE	E	42	M	L9	K	102.470
34	036	178	HPR	86	TRUSS, 24' LONG	E	23	M	H4	Q	101.413
35	036	63	LFS	60	REINFORCE JOISTS ON LOAD.DOCK	E	5	*	L8	F	97.111
36	036	161	LFS	59	ROLL OF ROOF FELT 4' WIDE	A	43	*	L8	N	95.822
37	036	18	CAR	90	BAG OF CONCRETE	A	6	*	C4	A	93.228
38	036	176	LFR	43	2"X4"X10' PINE	E	23	M	L9	Q	92.756
39	036	197	LFK	97	DOOR (W20"X24"GLASS130"X6'8"	A	82	D	L6	U	87.348
40	036	199	LFK	94	SOLID CORE DOOR 3'X7'(EXTERIOR)	A	82	D	L6	U	85.494
41	036	205	LFS	51	SOLID CORE DOOR 6'8X3'	A	82	D	L8	U	85.088
42	036	6	HPX	68	PILES, ON DOCKS OR WHARVES	E	6	*	H4	A	84.011
43	036	17	LFK	90	BAG OF CONCRETE	A	6	*	L6	A	82.974
44	036	59	LFH	75	RUN JACK HAMMER	E	7	*	L7	E	82.359
45	036	35	LXX	49	REINFORCE BRACINGS ON LOO.DOCKS	E	6	*	L8	C	82.276
46	036	116	LFS	48	SHINGLES (ASPHALT)	E	53	D	L8	J	80.848
47	036	187	LFR	35	8'X15' FRAME	E	65	M	L9	T	80.626
48	036	141	CAR	70	SACK CONCRETE	E	25	*	C4	L	79.842
49	036	88	LFS	46	TAR(5 GAL CAN/BUCKET)	A	57	D	L8	H	77.947
50	036	206	LFS	45	BUNDLE OF SHEET ROCK(4'X8'X1/2")	A	85	D	L8	V	76.473

OBS	WTP	WTF	WTAVG2	PWT	PF	PXI	SIZE	ADJ	AVGXI	RANK	ADJXI
26	0.22	0.03288	0.126438	0.014014	1.16313	1.9765	1813	0.973141	95.2138	1	92.6564
27	0.33	0.01096	0.155479	0.017232	1.36136	2.3580	1813	0.973141	95.2138	2	92.6564
28	0.42	0.03288	0.226438	0.025097	1.88227	3.3260	1813	0.973141	95.2138	3	92.6564
29	0.57	1.00000	0.785000	0.087004	7.83039	11.4611	1813	0.973141	95.2138	4	92.6564
30	0.57	1.00000	0.785000	0.087004	6.96035	10.5224	1813	0.973141	95.2138	5	92.6564
31	0.41	0.01096	0.210479	0.023328	1.39969	2.6982	1813	0.973141	95.2138	6	92.6564
32	0.06	0.03288	0.046438	0.005147	0.34999	0.5510	1813	0.973141	95.2138	7	92.6564
33	0.42	0.03288	0.226438	0.025097	1.25485	2.5717	1813	0.973141	95.2138	8	92.6564
34	0.23	0.03288	0.131438	0.014568	1.25283	1.4774	1813	0.973141	95.2138	9	92.6564
35	0.05	0.03288	0.041438	0.004593	0.27557	0.4460	1813	0.973141	95.2138	10	92.6564
36	0.43	0.03288	0.231438	0.025651	1.51342	2.4579	1813	0.973141	95.2138	11	92.6564
37	0.06	0.03288	0.046438	0.005147	0.46322	0.4798	1813	0.973141	95.2138	12	92.6564
38	0.23	0.03288	0.131438	0.014568	0.62641	1.3512	1813	0.973141	95.2138	13	92.6564
39	0.82	1.00000	0.910000	0.100859	9.78328	8.8098	1813	0.973141	95.2138	14	92.6564
40	0.82	1.00000	0.910000	0.100859	9.48071	8.6228	1813	0.973141	95.2138	15	92.6564
41	0.82	1.00000	0.910000	0.100859	5.14379	8.5819	1813	0.973141	95.2138	16	92.6564
42	0.06	0.03288	0.046438	0.005147	0.34999	0.4324	1813	0.973141	95.2138	17	92.6564
43	0.06	0.03288	0.046438	0.005147	0.46322	0.4271	1813	0.973141	95.2138	18	92.6564
44	0.07	0.03288	0.051438	0.005701	0.42758	0.4695	1813	0.973141	95.2138	19	92.6564
45	0.06	0.03288	0.046438	0.005147	0.25220	0.4235	1813	0.973141	95.2138	20	92.6564
46	0.53	1.00000	0.765000	0.084788	4.06981	6.8549	1813	0.973141	95.2138	21	92.6564
47	0.65	0.03288	0.341438	0.037843	1.32450	3.0511	1813	0.973141	95.2138	22	92.6564
48	0.25	0.03288	0.141438	0.015676	1.09733	1.2516	1813	0.973141	95.2138	23	92.6564
49	0.57	1.00000	0.785000	0.087004	4.00221	6.7817	1813	0.973141	95.2138	24	92.6564
50	0.85	1.00000	0.925000	0.102521	4.61345	7.8401	1813	0.973141	95.2138	25	92.6564

8 PERC - this column gives the % participation

9 FREQ - this gives the frequency of accurancy of the activity D (daily), W (weekly), M (monthly), S (semi-yearly), A (annually)

10 SMTASK - simulated task code L_2, L_6,... P_1, P_2,... H_2, ... C_3, ... etc.

11 TASK - Task code, A, B, C, ..., etc.

12 X1 - equivalent value for X1

13 WTP - weighting factor for percent participation

14 WTF - weighting factor for frequency of performance

15 WTAVG2 - average weight given. The average of columns 14 and 15

16 PWT - proportion of total weight given to the activity

17 PF - column 5 x column 16

18 PX1 - contribution of this activity towards the weight average X1 (column 12 x column 16)

19 SIZE - no of airmen required for AFSC (size of AFSC's)

20 ADJ - size adjustment factor $(1 - \frac{S}{67500})$.

21 AVGX1 - Total of column 19 or the weighted average X1 for the AFSC

22 RANK - rank order based on X2 value in column 12

23 ADJX1 - the weighted average X1 adjusted for the number of airmen assigned to the AFSC.

For the AFSC 552X0, the weighted average X1 is 92.6 lbs. Based on assignment criterion 1, an airman whose X1 test score (incremental 6 ft. lift) is equal to or exceeds 90.00 lbs is eligible for assignment to this AFSC. Because of 10 lb. increments in the 6 ft. incremental test the AFSC demand score is rounded downwards to nearest 10 lb interval.

Similarly for the AFSC 423X4, an airman whose X1 test score is equal to or exceeds 90.00 lbs. is eligible for assignment to this

AFSC. An airman whose X1 score is less than 90 lbs. should not be assigned to this AFSC.

A total of 162 AFSCs were studied in this project. However, some data were lacking and hence some AFSCs were not considered for application of the assignment criterion. Three primary reasons account for not applying the assignment criterion. These are:

(1) No percent participation data were available.

(2) Not enough tasks or activities were available in the AFSC.

(3) More than half of the activities considered in establishing the AFSC demand score were based on estimates rather than actual data.

Table 41 shows the AFSC which were not considered for application of the assignment criterion and the reason for this decision. Table 42 shows the remaining AFSCs, their current rating and their adjusted demand score.

Discussion

The recommended assignment criterion can be modified to accept more than one test in the test battery. A candidate test which could be added is X3, the 70 lb. elbow hold, however, additional test may not significantly affect the discrimination abilities of the assignment criterion.

Table 42 indicates that there are few AFSCs designated as X1 AFSC, which have a relatively low demand score. Similarly, there are few AFSCs designated as X3 AFSC, which have a relatively high score. Figures 47-49 shows the sensitivity of the assignment criterion to the number of activities selected. As the number of activities used to apply the assignment increase, the demand score tends to decrease.

Using the 6 foot incremental lift, X1, score for the incumbents, it is possible to estimate the percentages of airmen who would qualify for an AFSC. Table 43 shows each of the AFSCs and the estimated percentage of airmen who would qualify for each AFSC. Such percentage is only an estimate and is primarily a function of the enlistees physical capabilities and the male/female mix in the Air Force.

TABLE 41

AFSCs NOT CONSIDERED UNDER THE ASSIGNMENT CRITERION

AFSC	No Participation Data	Percent	Not enough Activities (12 or less Activities)	Large No. of Estimates (13 or more Estimates)
A431X2	X			
A902X0	X			
113X0B	X			X
113X0C	X			
115X0			X	
222X0	X			
231X0	X			
231X2	X			
272X0			X	
291X0				X
294X0			X	
295X0				X
296X0			X	
297X0			X	
304X5				X
306X1				X
316X0F			X	
316X0G	X			
316X0T	X			
316X1	X			
316X2G	X			
316X3	X			
321X0K	X			
321X1G	X			
325X0				X
326X0D	X			
326X0C	X			
326X3A	X			
326X5	X			
328X2	X			
328X5	X			
341X6				X
362X3				X
404X0				X
426X3	X			
443X0G	X			
443X1	X			

TABLE 41 (Continued)

AFSCs NOT CONSIDERED UNDER THE ASSIGNMENT CRITERION

AFSC	No Percent Participation Data	Not enough Activities (12 or less Activities)	Large No. of Estimates (13 or more Estimates)
445X0E		X	
445X0F			X
445X1			X
463X0			X
472X0			X
472X4	X	X	
511X0		X	
511X1	X	X	
542X0	X		
454X1	X		
552X0			X
591X0	X		
591X1	X		
602X1			X
602X2	X		
612X0	X		
702X0B	X		
741X1	X		
753X0	X		
791X0		X	
811X2			X
811X2A	X		
904X0			X
911X0			X
914X0		X	
99505	X		
99604	X		

TABLE 42

DEMAND SCORE FOR THE REMAINING AFSC
WITH THEIR CURRENT RATING

AFSC	Adjusted Demand Score	X-Factor Rating	AFSC	Adjusted Demand Score	X-Factor Rating
111X0	50	2	361X1	90	2
112X0	70	2	362X4	70	2
114X0	110	2	392X0	80	3
121X0	100	1	404X1	60	3
122X0	100	2	423X0	70	3
231X1	40	3	423X1	60	3
242X0	80	3	423X2	110	1
251X0	50	3	423X3	80	3
275X0	90	2	423X4	90	3
293X3	60	3	423X5	80	3
302X0	80	3	426X2	80	3
303X1	50	3	427X0	60	3
303X2	80	3	427X1	50	3
304x0	90	3	427X3	40	3
304X1	50	3	427X4	80	3
304X4	80	3	427X5	70	3
306X0	80	3	431X0	90	.
306X2	80	3	431X0	80	2
307X0	70	3	431X2	90	2
316X2	70	2	443X0E	80	1
316X2T	60	3	443X0P	70	1
321X2	110	3	445X0G	70	2
322X2	80	.	461X0	110	3
322X2C	60	2	462X0	100	3
324X0	90	3	464X0	70	3
325X1	60	3	472X1	60	.
326X4	60	3	472X2	70	3
326X6	80	3	472X3	80	3
326X7	50	3	542X1	80	1
326X8	80	3	542X2	70	3
328X0	60	3	545X0	100	1
328X1	50	3	545X2	100	1
328X3	110	1	551X0	70	1
328X4	70	2	551X1	80	1
341X4	60	3	552X1	80	2
341X7	50	3	552X2	70	3
361X0	80	1	552X4	70	3

TABLE 42 (Continued)

DEMAND SCORE FOR THE REMAINING AFSC
WITH THEIR CURRENT RATING

AFSC	Adjusted Demand Score	X-Factor Rating	AFSC	Adjusted Demand Score	X-Factor Rating
552X5	50	3	645X2	50	3
553X0	30	3	791X0	40	3
566X0	60	3	811X0	40	2
566X1	80	3	902X0	70	3
571X0	80	1	902X2	40	3
602X0	40	3	903X0	40	3
603X0	50	3	905X0	60	3
605X0	50	3	907X0	80	3
605X1	90	3	908X0	90	3
611X0	80	3	913X0	30	3
622X1	40	3	914X1	50	3
631X0	70	2	915X0	60	3
645X1	100	3			

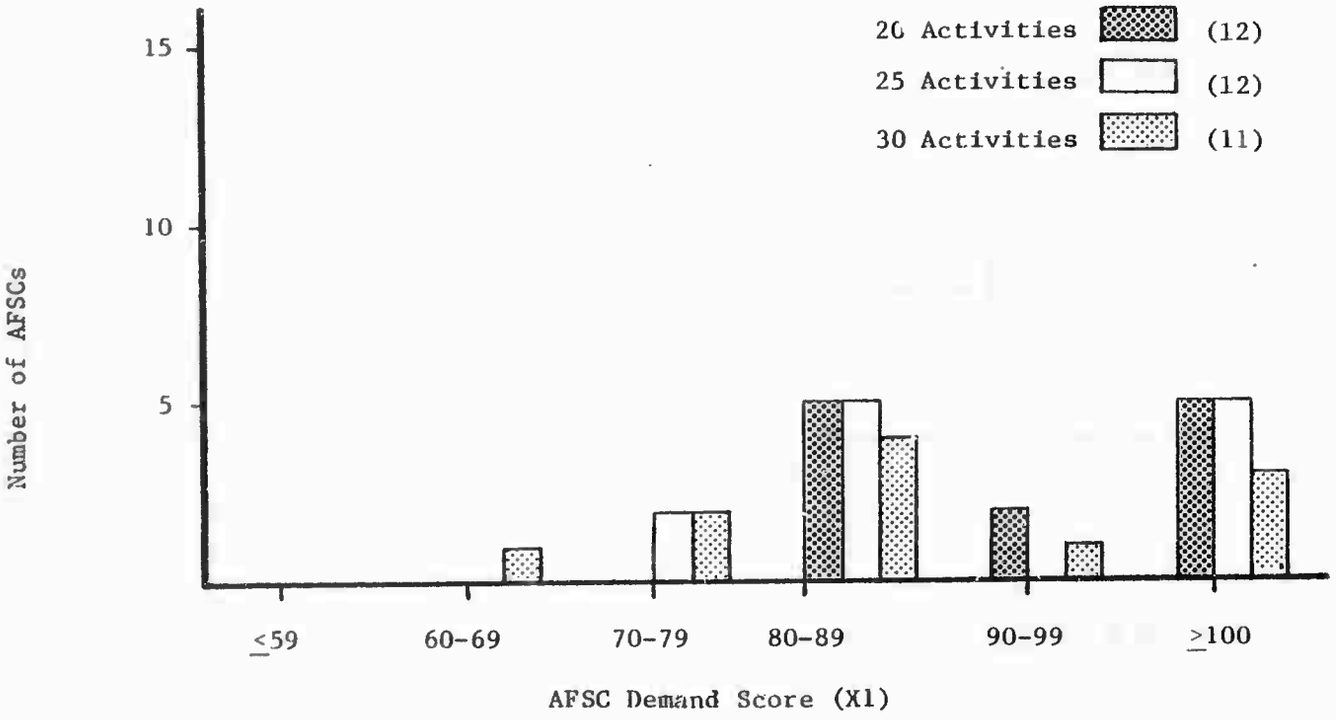


Figure 47. Effect of Number of Activities Selected on Demand Score for X-1 AFSCs*.

*322X2, 431X0 and 472X1 are unrated AFSCs (No X-Factor Rating).

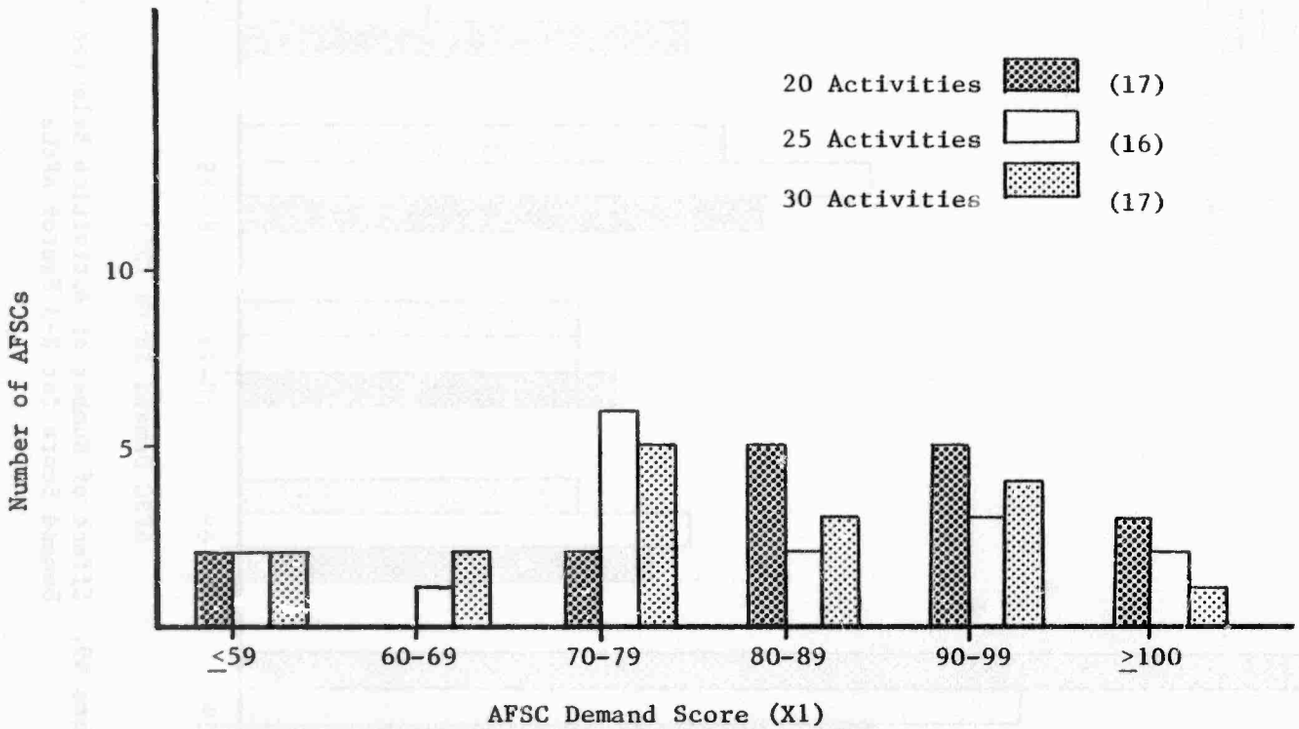


Figure 48. Effect of Number of Activities Selected on Demand Score for X-2 Factor AFSCs.

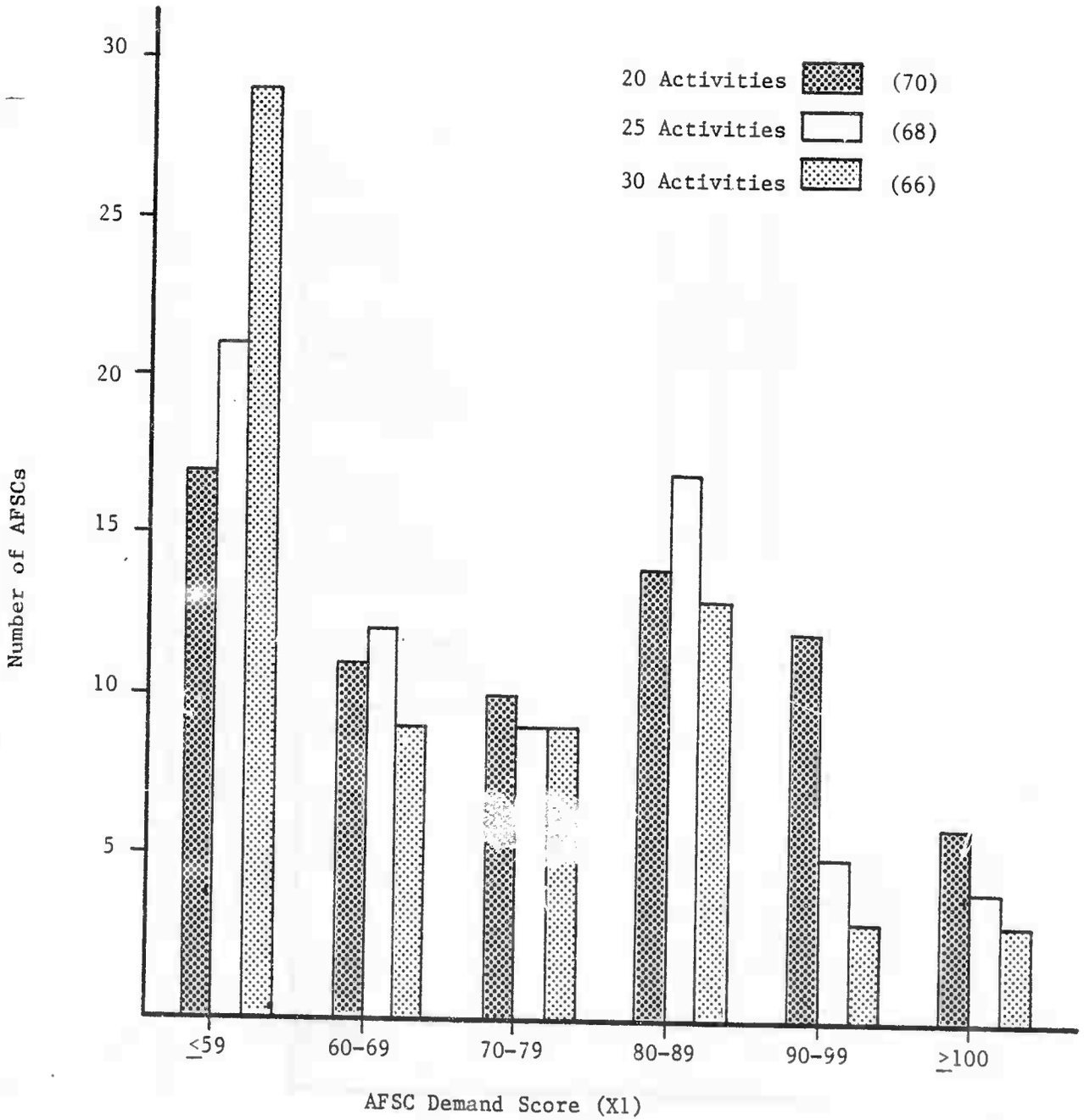


Figure 49. Effect of Number of Activities Selected on Demand Score for X-3 Factor AFSCs.

TABLE 43

ESTIMATED PERCENTAGE OF AIRMEN QUALIFYING
FOR THE VARIOUS AFSCs

AFSC	Adjusted Demand Score	% of Airmen Qualifying	X-Factor Rating	AFSC	Adjusted Demand Score	% of Airmen Qualifying	X-Factor Rating
111X0	50	97.81	2	361X1	90	82.15	2
112X0	70	86.89	2	362X4	70	86.89	2
114X0	110	62.11	2	392X0	80	84.15	3
121X0	100	77.05	1	404X1	60	93.81	3
122X0	100	77.05	2	423X0	70	86.89	3
231X1	40	100.00	3	423X1	60	93.81	3
242X0	80	84.15	3	423X2	10	62.11	1
251X0	50	97.81	3	423X3	80	84.15	3
275X0	90	82.15	2	423X4	90	82.15	3
293X3	60	93.81	3	423X5	80	84.15	3
302X0	80	84.15	3	426X2	80	84.15	3
303X1	50	97.81	3	427X0	60	93.81	3
303X2	80	84.15	3	427X1	50	97.81	3
304x0	90	82.15	3	427X3	40	100.00	3
304X1	50	97.81	3	427X4	80	84.15	3
304X4	80	84.15	3	427X5	70	86.89	3
306X0	80	84.15	3	431X0	90	82.15	.
306X2	80	84.15	3	431X0	80	84.15	2
307X0	70	86.89	3	431X2	90	82.15	2
316X2	70	86.89	2	443X0E	80	84.15	1
316X2T	60	93.81	3	443X0P	70	86.89	1
321X2	110	62.11	3	445X0G	70	86.89	2
322X2	80	84.11	.	461X0	10	62.11	3
322X2C	60	93.81	2	462X0	100	77.05	3
324X0	90	82.15	3	464X0	70	86.89	3
325X1	60	93.81	3	472X1	60	93.81	.
326X4	60	93.81	3	472X2	70	86.89	3
326X6	80	84.15	3	472X3	80	84.15	3
326X7	50	97.81	3	542X1	80	84.15	1
326X8	80	84.15	3	542X2	70	86.89	3
328X0	60	93.81	3	545X0	100	77.05	1
328X1	50	97.81	3	545X2	100	77.05	1
328X3	110	62.11	1	551X0	70	86.89	1
328X4	70	86.89	2	551X1	80	84.15	1
341X4	60	93.81	3	552X1	80	84.15	2
341X7	50	97.81	3	552X2	70	86.89	3
361X0	80	84.15	1	552X4	70	86.89	3

TABLE 43 (Continued)

ESTIMATED PERCENTAGE OF AIRMEN QUALIFYING
FOR THE VARIOUS AFSCs

AFSC	Adjusted Demand Score	% of Airmen Qualifying	X-Factor Rating	AFSC	Adjusted Demand Score	% of Airmen Qualifying	X-Factor Rating
552X5	50	97.81	3	645X2	50	97.81	3
553X0	30	100.00	3	791X0	40	100.00	3
566X0	60	93.81	3	811X0	40	100.00	2
566X1	80	84.15	3	902X0	70	86.89	3
571X0	80	84.15	1	902X2	40	100.00	3
602X0	40	100.00	3	903X0	40	100.00	3
603X0	50	97.81	3	905X0	60	93.81	3
605X0	50	97.81	3	907X0	80	84.15	3
605X1	90	82.15	3	908X0	90	82.15	3
611X0	80	84.15	3	913X0	30	100.00	3
622X1	40	100.00	3	914X1	50	97.81	3
631X0	70	86.89	2	915X0	60	93.81	3
645X1	100	77.05	3				

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APPENDIX A

MINI QUESTIONNAIRE

AIR FORCE SPECIALTY CODE (AFSC)
MINI QUESTIONNAIRE

Different "physical task performance" questionnaires, i.e., each applicable to a specific AFSC (see example at the end of this Appendix), were administered to a combined total of 76 incumbents at Dyess AFB, Texas and Reese AFB, Texas covering 11 AFSCs that are currently rated as X-factor 1 (see Table A-1). The purposes of the survey were to:

(1) determine the general nature of the physical tasks that may be encountered in AFSCs requiring "heavy" and/or "very heavy work" (e.g., manual materials handling, torquing, running, standing, and so forth),

(2) determine the degree of task procedure standardization,

(3) determine the relative task requirements as a function of mission, and

(4) obtain, based on items (1), (2), and (3) above, data that would enable a better selection of an appropriate strength/stamina "initial test battery" to be used in predicting the ability of an individual to "successfully" perform the AFSCs which have "heavy" and/or "very heavy" physical demands.

The survey results (see Table A-2 for summary) indicate that the incumbents perceive a total of 286 tasks as being "physically demanding." The survey results showed that these 286 tasks can be categorized as follows:

(1) 258 manual materials handling (MMH) type activities or 90 percent,

(2) 7 torquing activities of some type or 3 percent, and

(3) 21 miscellaneous activities, such as sentry duty, guard duty, dog catching, and first aid involving resuscitation or 7 percent.

Based on undocumented observations, undocumented verbal communications with the incumbents, and questionnaire narrative responses, it was determined that task procedure standardization is not necessarily Air Force, Command, or Base-wide, and that task requirements are for some AFSCs, a function of the unit's mission, e.g., SAC, MAC, or ATC, oriented. It was also confirmed that supervisors are experiencing difficulties in manpower planning due to physical deficiencies of the incumbents. However, this may be the result, in part, of a "prejudgement" by the supervisors regarding the abilities of an individual to perform a "heavy/very heavy" task. A few of the incumbents indicated that the supervisors did not assign them to physically demanding tasks because the supervisor did not think the incumbent was capable of performing the task even though there was no quantitative data available to substantiate this "prejudgement."

TABLE A-1. AFSC'S AND INCUMBENT'S SURVEYED

AFSC	Dyess (Sac-Mac base)	Reese (ATC base)
	Number of Incumbents	
113X0 - Flight Engineer	(2)	NA*
114X0 - Aircraft Loadmaster	(3)	NA
362X4 - Telephone Equipment	(1)	NA
551X0 - Pavements Maintenance	(3)	(2)
551X1 - Construction Equipment	(2)	(2)
552X0 - Carpentry	(2)	(2)
571X0 - Fire Protection	(5)	(6)
631X0 - Fuel	(5)	(4)
811X0 - Security	(14)	(9)
811X2 - Law Enforcement	(4)	NA
922X0 - Aircrew Life Support	(6)	(4)
	47	29

NA* not available at this base.

TABLE A-2. AFSC QUESTIONNAIRE RESULTS SUMMARY

AFSC	TOTAL TASKS DIFFICULT	TASK CATEGORY					
		MMH		TORQUE		MISC	
		Frequency	Percent	Frequency	Percent	Frequency	Percent
113X0	19	17	90	1	5	1	5
114X0	21	20	95			1	5
362X4	10	10	100				
551X0	33	33	100				
551X1	23	21	91	2	9		
552X0	33	32	97			1	3
571X0	38	36	95			1	3
631X0	32	31	97			1	3
811X0	23	23	100				
811X2	31	19	61			12	24
922X0	23	16	70	3	13	4	17
	286	258	90	7	3	21	7

AFSC QUESTIONNAIRE

We are asking you to complete the following questionnaire so that we can learn more about your AFSC. In order to get the most from our survey, we ask that you carefully consider your answer for each question. The information which we obtain will be kept in complete confidence and will not be used for any purpose other than the present analysis of USAF AFSCs. Thank you for your cooperation; it is greatly appreciated.

In this survey, we will be using a term which we want to clearly define. The word DIFFICULT will be used to refer to tasks which require more than everyday, normal, physical effort and which, if, for example, were repeated several times, would leave you TIRED, OUT OF BREATH, NEEDING REST, OVER-HEATED, or WITH MUSCLES WHICH WILL BE TIRED AND/OR SORE. There are many different factors which might cause a task to be rated as difficult for example, length of time it must be performed, temperature, or access to work space. Your answers for the following questions will help us identify those tasks which are physically difficult.

The questionnaire is divided into three different parts. In the first part we will ask some questions which will tell us something about you. This information is requested only to give us some idea about the person answering the other questions. If for any reason you would rather not answer any of these questions, you may leave them blank and continue with the remainder of the questionnaire.

The second part of the survey will be a list of tasks, derived from AF occupational surveys, which MIGHT be required of a person with your AFSC. There are three numbers following each task. If the task is one you do or have done, and if you find or have found it DIFFICULT, circle one -1- on the form. If it is one which you have performed but which is/was not difficult, circle the -2- on the form. If you have not done the task, circle the -3-. If you do, or have done, other tasks, other than those listed, as a part of your job or if others you work with do or have done other tasks as a part of their job and if these tasks could be described as difficult, list them in the blank spaces and place the number -1- or -2- after the task description (e.g., open hanger door manually -1-; operate torque wrench -1-; stand parade rest while on guard duty -1-).

For each task you identified as difficult, we would like for you to BRIEFLY describe the aspect of the task which makes it difficult. Use your own words to describe the physical aspects which make it difficult--for example, lift and hold an A/C tire, manually move AGE from shop to A/C, work is done overhead, etc. If you can, we would like for you to identify the number of lbs you lift, the amount of force applied when torquing, the type of position you must assume to accomplish the difficult task, etc. In other words, be as specific as you can.

Finally, in the last part of the questionnaire, there will be a number of incomplete sentences. We would like for you, in your own words, to complete the sentences.

PART 1

INSTRUCTIONS: Complete each of the following questions as accurately and as completely as possible. This information will be used for purposes of the present survey only.

1. NAME _____ 2. AGE _____
   LAST FIRST M.I.

3. PHYSICAL DISABILITY _____ 4. CURRENT AFSC ASSIGNMENT _____

5. LENGTH OF TIME IN AIR FORCE ____ YRS. (APPROXIMATE)

6. HOW LONG IN CURRENT AFSC _____ YRS. (APPROXIMATE)

7. MALE _____ FEMALE _____ 8. WEIGHT _____ 9. HEIGHT _____

10. LIST ALL/ANY OTHER AFSC'S TO WHICH YOU HAVE BEEN ASSIGNED

_____

_____

_____

_____

11. WHAT WAS YOUR JOB PRIOR TO ENTERING AIR FORCE? _____

_____

12. LIST ANY ATHLETIC EXPERIENCE WHICH YOU HAVE HAD IN THE PAST THREE YEARS. _____

_____

_____

13. ARE YOU ON A REGULAR PROGRAM OR EXERCISE? IF SO, PLEASE DESCRIBE IT? _____

_____

_____

PART 2

INSTRUCTIONS: The following list of tasks might be required of a person with your AFSC. If the task is one which you do or have done, and if you find, or found, it DIFFICULT, circle -1-; if you did not find it difficult but do or have done it, circle -2-. If you have not done the task as a part of your job, circle -3-. In the blank lines following (below) the task list, write down a short description of other tasks which you have done and found difficult. Use the blank spaces to the right of the list of tasks to BRIEFLY DESCRIBE THE ASPECT OF THE TASK WHICH MAKES IT DIFFICULT. Do this for each of the tasks which you circled -1- or which you have added.

AFSC 631X0 1-Difficult 2-Not difficult 3-Have not done

1. Fuel or defuel aircraft with R-5 tank trucks -1-2-3

2. Perform operator maintenance on tank trucks -1-2-3

3. Fuel or defuel aircraft with R-9 tank trucks -1-2-3

4. Fill mobile refueling units from bult storage -1-2-3

5. Fuel or defuel aircraft with R-8 tank trucks -1-2-3

6. Fuel aircraft with modified Panero hydrant systems -1-2-3

7. Issue automotive oil from base service stations -1-2-3

8. Issue lox to oxygen carts -1-2-3

9. Fuel aircraft with Panero hydrant system -1-2-3

AFSC 631X0 1-Difficult 2-Not Difficult 3-Have not done

10. Perform operator maintenance on bulk storage systems -1-2-3

11. Perform operator maintenance on Pritchard hydrant systems -1-2-3

12. Refull mobile water servicing units from demineralized water plants -1-2-3

13. Perform operator maintenance on hydrant trucks -1-2-3

14. Fuel aircraft with Phillips hydrant system -1-2-3

15. Perform operator maintenance on modified Panero hydrant systems -1-2-3

16. Fuel or defuel aircraft with R-2 condec tank trucks -1-2-3

17. Fill mobile oil units from oil storage facilities -1-2-3

18. Perform cryogenic liquid storage operator maintenance -1-2-3

19. Issue bulk oil to aircraft from MK-1 tank trucks -1-2-3

20. Perform operator maintenance on Panero hydrant systems -1-2-3

21. Perform operator maintenance on fueling semitrailers -1-2-3

22. Perform operator maintenance on vacuum pumps -1-2-3

23. Connect or disconnect off-loading hoses from barges -1-2-3

24. Fuel or defuel aircraft with R-14 air transportable hydrant systems -1-2-3

25. Perform operator maintenance on R-14 air transportable hydrant systems -1-2-3

26. Set hand brake on railway tank cars -1-2-3

27. Fill mobile oil units from drums -1-2-3

28. Fuel or defuel aircraft with R-25 air transportable hydrant systems -1-2-3

29. Perform operator maintenance on C-136, C-123, aerial bulk fuel delivery systems -1-2-3

30. Perform operator maintenance on R-22 air transportable hydrant systems -1-2-3

31. Position morring lines from barge or tanker to unloading points -1-2-3

32. Perform operator maintenance on R-25 air transportable hydrant systems -1-2-3

33. Perform operator maintenance on R-26 air transportable hydrant systems -1-2-3

34. Fuel or defuel aircraft with R-1 air transportable hydrant systems -1-2-3

AFSC 631X0 1-Difficult 2-Not Difficult 3-Have not done

35. Perform operator maintenance on R-1 air transportable hydrant systems -1-2-3

36. Perform operator maintenance on R-13 air transportable hydrant systems -1-2-3

37. Fuel or defuel aircraft with F-7 semitrailers -1-2-3

AFSC _____ 1 - Difficult 2 - Not Difficult 3 - Have not done

Other difficult tasks you or others within this AFSC are expected to perform

Part 3

INSTRUCTIONS: Complete each of the following sentences in your own words.

1. Rank order, by number, the five most difficult tasks listed in Part 2.

   1_____ 2_____ 3_____ 4_____ 5_____

2. Can you list, in rank order, five additional tasks which you find difficult or you think is difficult for others to perform. Please state, as before, why you think it is difficult.

   1._____

   _____

   2._____

   _____

   3._____

   _____

   4._____

   _____

   5._____

   _____

3. What tasks may appear to be easy but are difficult to perform_____

   _____

4. When I think of physical work I think of _____

5. In order to meet the physical demands of my present AFSC a person must possess the following physical attributes:_____

   _____

6. The physical activities which help most with difficult tasks are_____

   _____

APPENDIX B

QUESTIONNAIRE #1

UNITED STATES AIR FORCE

PHYSICAL DEMANDS SURVEY

MEDICAL SERVICE AND ALLERGY/IMMUNOLOGY
SPECIALIST CAREER LADDERS

AFSCs 90230, 90250, 90270, and 90292

Return completed to CBPO within
10 working days per AFR 35-2

MANPOWER AND PERSONNEL DIVISION
AIR FORCE HUMAN RESOURCES LABORATORY
BROOKS AFB, TEXAS 78235
AUTOVON 240-2847
AFPT 80-902-167

INSTRUCTIONS

We are asking you to complete the following survey so that we can identify tasks in your career ladder that are physically demanding (that is, tasks requiring a large amount of physical strength or endurance). As a subject matter expert in the 902X0 career ladder, you are best qualified to make the evaluation. In order to get the most from the survey, we ask that you carefully consider your response to each question.

This survey contains two sections - a brief background information section and a more extensive listing of tasks typically performed in your career ladder. After completing the background section, you will be asked to rate each task on a 10-point physical strength and endurance scale. Tasks requiring physical strength and endurance are defined as those involving significant use of the "large" muscle groups in the arms, back or legs. These would include requirements for lifting, lowering or carrying heavy or cumbersome objects, pushing or pulling, torquing or any other demand for frequent or continuous exertion of muscular effort. To establish a common frame of reference for rating each task, the following scale definitions are provided:

Rating Scale for Physical Strength and Endurance

Scale Point	Description of Effort
0	No Significant Physical Demand – Corresponding requirement would include periodic lifting of 9 lbs or less – Includes most administrative and clerical tasks.
1	Extremely Light – Corresponding requirement would include periodic lifting of 10–19 lbs to a height of 5 ft OR an equivalent demand for frequent or continuous muscular effort.
2	Very Light – Corresponding requirement would include periodic lifting of 20–29 lbs to a height of 5 ft OR an equivalent demand for frequent or continuous muscular effort.
3	Light – Corresponding requirement would include periodic lifting of 30–39 lbs to a height of 5 ft OR an equivalent demand for frequent or continuous muscular effort.
4	Light to Moderate – Corresponding requirement would include periodic lifting of 40–49 lbs to a height of 5 ft OR an equivalent demand for frequent or continuous muscular effort.
5	Moderate – Corresponding requirement would include periodic lifting of 50–59 lbs to a height of 5 ft OR an equivalent demand for frequent or continuous muscular effort.
6	Moderate to Heavy – Corresponding requirement would include periodic lifting of 60–69 lbs to a height of 5 ft OR an equivalent demand for frequent or continuous muscular effort.
7	Heavy – Corresponding requirement would include periodic lifting of 70–79 lbs to a height of 5 ft OR an equivalent demand for frequent or continuous muscular effort.
8	Very Heavy – Corresponding requirement would include periodic lifting of 80–89 lbs to a height of 5 ft OR an equivalent demand for frequent or continuous muscular effort.
9	Extremely Heavy – Corresponding requirement would include periodic lifting of 90 lbs or more to a height of 5 ft OR an equivalent demand for frequent or continuous muscular effort.
X	No Knowledge of Task Requirement

When you consider the overall level of physical strength and endurance required by each task, it is requested that you provide ratings on the basis of:

a. The most demanding aspect of each task. For example, if performing a task requires some light lifting and some heavy lifting, provide ratings based on the higher requirement. In considering the most demanding aspect of each task, also take into account any factors, such as unusual posture, frequency and duration of sustained work which might contribute to the overall demand level.

b. The level of demand placed on a single individual performing the task. Occasionally a given task will be performed by more than one person. In this case, assume that the workload is shared equally by all members performing. (i.e., if a 300 lb object is generally lifted by 3 people, the task demand for a single individual would be 100 lbs.)

AND

c. The level of demand required by the complete task from start to finish. For example, any preliminary activities that are an integral part of the task should be considered in rating the task.

To obtain the maximum response possible, it is requested that you rate each task of which you have any knowledge. These would include tasks you presently perform, which you have performed at a prior time and those which you have observed others performing. Please provide your best estimates even though you may not be absolutely certain of the rating. Note: If there are any physically demanding tasks in your career ladder that are not listed in the booklet, please list them on the blank pages provided at the end of the booklet and rate them as you would the other tasks.

Now, begin the background section on the next page. When this is completed, proceed to the task ratings. Thank you for your cooperation in this survey.

BACKGROUND INFORMATION

Date

Case Control Number (1-4)

PLEASE PRINT INFORMATION REQUESTED AND CHECK APPLICABLE BOXES

NAME (*FIRST, LAST, MI*) (5-22)

DATE OF BIRTH — Year Month Day (23-28)

SEX — MALE / FEMALE (29)

GRADE — E1 AB; E2 AMN; E3 A1C; E4 SRA SGT; E5 SSGT; E6 TSGT; E7 MSGT; E8 SMSGT; E9 CMSGT

SOCIAL SECURITY ACCOUNT NUMBER (*SSAN*) (31-39)

TELEPHONE — AREA CODE; DUTY EXTENSION (30)

HEIGHT — FT; IN (40-42)

WEIGHT — LBS (43-45)

PRIMARY AFSC — PREFIX; NUMBER; SUFFIX (46-52)

DUTY AFSC — PREFIX; NUMBER; SUFFIX (53-59)

MAJOR COMMAND (*CHECK ONE*)

A AAC; G DMAAC; C ADCOM; E AFAFC; Y AFCS; O AFDSDC; F AFLC

M AFRES; H AFSC; I ARPC; J ATC; K AU; N HQ USAF or FLD EXT; Q MAC

R PACAF; S SAC; T TAC; B USAFA; D USAFE; U USAFSS; X OTHER UNIT or ORGANIZATION (60)

TOTAL MONTHS IN PRESENT JOB (Card 02: 5-7)

TOTAL MONTHS AT PRESENT BASE (Card 02: 8-10)

TOTAL MONTHS IN DUTY AFSC (Card 02: 11-13)

TOTAL MONTHS IN CAREER FIELD (Card 02: 14-16)

TOTAL MONTHS ACTIVE FEDERAL MILITARY SERVICE (Card 02: 17-19)

NUMBER OF SUBORDINATES WHO REPORT TO YOU DIRECTLY FOR SUPERVISION (Card 02: 20-21)

DURING THE PAST YEAR, HAVE ANY OF YOUR SUBORDINATES EXPERIENCED DIFFICULTY PERFORMING IN THIS CAREER LADDER BECAUSE THE PHYSICAL DEMANDS OF THE JOB EXCEEDED THEIR PHYSICAL STRENGTH OR STAMINA CAPABILITIES? YES / NO

ORGANIZATION (Card 02: 22-23)

BASE OR INSTALLATION (Card 03: 5-8)

PRESENT WORK ASSIGNMENT (*POSITION OR JOB TITLE*) (Card 03: 9-73)

PRIVACY ACT STATEMENT

AUTHORITY: 5 USC Sec 301, AFR 35-2 & EO 9397. **DISCLOSURE**: COMPLETION OF THE INVENTORY, INCLUDING SSAN IS MANDATORY. FAILURE TO PROVIDE COMPLETE INFORMATION WILL DETRACT FROM THE AIR FORCE'S CAPABILITY TO FULFILL THE FOLLOWING PURPOSES. **PRINCIPAL PURPOSE**: DEVELOPMENT OF SCREENING PROCEDURES AND CORRESPONDING JOB REQUIREMENTS FOR PHYSICAL STRENGTH AND STAMINA. **ROUTINE USES**: PERSONNEL AND OCCUPATIONAL RESEARCH, JOB REDESIGN AND DEVELOPMENT OF TRAINING PROGRAMS.

TASK RATING INSTRUCTIONS

The tasks listed on the following pages are grouped under duty headings. Please rate each task on the equivalent level of physical strength and endurance required to perform it. Use a pencil or pen to record your ratings in the column to the right of the task statements.

Examples: Rate Here →

Schedule maintenance workload and duty assignments	0	
Overhaul rotor blades	7	
Runup engines for operational checks	2	
Etc.		

Remember -

- Rate all tasks of which you have knowledge
- Rate the demands for a single member performing
- Consider task from start to completion

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 1 OF 29 PAGES

INSTRUCTIONS: RATE EACH TASK BELOW ON ITS REQUIREMENT FOR PHYSICAL STRENGTH AND/OR ENDURANCE.

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RATING SCALE
0 = No Significant Demand
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3 = Light
4 = Light to Moderate
5 = Moderate
6 = Moderate to Heavy
7 = Heavy
8 = Very Heavy
9 = Extremely Heavy
X = Don't Know

A. ORGANIZING AND PLANNING

	RATE HERE	
1. Assign personnel to duty positions		5
2. Attend professional staff meetings		6
3. Conduct or attend ward master or NCOIC meetings		7
4. Coordinate work activities with other sections		8
5. Determine personnel requirements		9
6. Develop or improve work methods or procedures		10
7. Develop or revise organization of section		11
8. Develop or update organizational charts		12
9. Develop or write local medical facility operating instructions or standard operating procedures		13
10. Draft budget estimates		14
11. Establish equipment or supply levels		15
12. Establish research procedures		16
13. Establish sanitation standards		17
14. Establish work priorities		18
15. Plan medical disaster control procedures for section or facility		19
16. Plan medical laboratory, X-ray, or pharmacy activities		20
17. Plan or coordinate hospital tours		21
18. Plan or coordinate mass immunizations for groups or individuals		22
19. Plan or develop status boards or charts		23
20. Plan or schedule work assignments		24
21. Plan physical layout of medical service facilities		25
22. Plan records maintenance		26
23. Plan safety programs		27
24. Plan security programs		28

Note: You may leave the rating for the administrative/supervisory tasks listed under this duty blank if they require significant demand. Otherwise mark the appropriate value.

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 2 OF 29 PAGES

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9 = Extremely Heavy
X = Don't Know

A. ORGANIZING AND PLANNING (CONTINUED)

RATE HERE

25. Prepare civilian time cards		29
26. Prepare requisitions for supplies or equipment		30
27. Schedule leaves or passes		31
If you know of a physically demanding task under this duty which does not appear in the list, please add it to the blank pages at the end of the booklet and rate it as you would the other tasks.	XXXXXXXXXXXXXX	
	XXXXXXXXXXXXXX	
	XXXXXXXXXXXXXX	

B. DIRECTING AND IMPLEMENTING

	XXXXXXXXXXXXXX	
28. Coordinate interhospital appointments for outpatient consultations with other medical facilities		32
29. Direct disaster control programs for the section or facility		33
30. Direct mass immunization programs		34
31. Direct physical exercise or conditioning programs		35
32. Direct preparation and maintenance of records or reports		36
33. Draft changes to or revise manuals or technical publications		37
34. Draft or revise job descriptions		38
35. Implement procedures for distribution of reports, manuals, or directives		39
36. Implement safety practices		40
37. Initiate requests for personnel replacements		41
38. Inspect or advise subordinates in medical ethics		42
39. Interview civilian job applicants		43
40. Maintain status boards or charts		44
41. Monitor weight control programs		45
42. Orient newly assigned medical personnel		46
43. Prepare correspondence		47

Note: You may leave the ratings for the administrative/supervisory tasks listed under this duty blank if they require "no significant demand." Otherwise mark the appropriate value.

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 3 OF 29 PAGES

INSTRUCTIONS: RATE EACH TASK BELOW ON ITS REQUIREMENT FOR PHYSICAL STRENGTH AND/OR ENDURANCE.

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9 = Extremely Heavy
X = Don't Know

B. DIRECTING AND IMPLEMENTING (CONTINUED)

RATE HERE →

44. Prepare unit records, graphs, reports, or studies		48
45. Screen solicitations or advertising media		49
46. Supervise Allergy/Immunology Specialists (AFSC 91234)		50
47. Supervise Allergy/Immunology Technicians (AFSC 91274)		51
48. Supervise Apprentice Medical Service Specialists (AFSC 90230)		52
49. Supervise civilian personnel		53
50. Supervise Clinic Superintendents (AFSC 91295)		54
51. Supervise medical personnel with AFSCs other than 902X0, 90292, 912X4 or 91295		55
52. Supervise Medical Service Specialist (AFSC 90250)		56
53. Supervise Medical Service Superintendents (AFSC 90292)		57
54. Supervise Medical Service Technician (AFSC 90270)		58
55. Write technical papers for publication		59
If you know of a physically demanding task under this duty which does not appear in the list, please add it to the blank pages at the end of the booklet and rate it as you would the other tasks.	XXXXXXXXXXXX	
	XXXXXXXXXXXX	
	XXXXXXXXXXXX	
C. INSPECTING AND EVALUATING	XXXXXXXXXXXX	
	XXXXXXXXXXXX	
56. Advise subordinates on resolution of technical problems		60
57. Counsel subordinates on military or personal problems		61
58. Evaluate adherence to work schedules		62
59. Evaluate compliance with work standards		63
60. Evaluate individuals for promotion, demotion, or reclassification		64
61. Evaluate or establish procedures for storage, inventory, or inspection of property items		65
62. Evaluate or provide recommendations for improving stock control		66

Note: You may leave the rating for the administrative/supervisory tasks listed under this duty blank if they involve no significant demand. Otherwise mark the appropriate value.

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 4 OF 29 PAGES

INSTRUCTIONS: RATE EACH TASK BELOW ON ITS REQUIREMENT FOR PHYSICAL STRENGTH AND/OR ENDURANCE.

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X = Don't Know

C. INSPECTING AND EVALUATING (CONTINUED)

RATE HERE

63. Evaluate quality of patient care		57
64. Evaluate routine reports		68
65. Evaluate suggestions		69
66. Initiate reports on unsatisfactory equipment		70
67. Inspect and evaluate the maintenance of status boards or charts		71
68. Inspect or evaluate adherence to established standards of sanitation, cleanliness, or neatness		72
69. Inspect physical layout of medical service facilities	04:	73
70. Inventory equipment or supplies		5
71. Investigate accidents or incidents		6
72. Make security checks of medical facilities		7
73. Prepare airman performance reports (APRs)		8
74. Prepare recommendations for special awards		9
75. Prepare recommendations for special corrective action in cases or recurring problems		10
76. Write civilian performance ratings or supervisory appraisals		11

If you know of a physically demanding task under this duty which does not appear in the list, please add it to the blank pages at the end of the booklet and rate it as you would the other tasks.

Note: You may leave the ratings for the administrative/supervisory tasks listed under this duty blank if they require no significant demand. Otherwise mark the appropriate value.

D. TRAINING

77. Administer oral, written, or performance tests		12
78. Conduct formal classroom training for medical personnel		13
79. Conduct medical disaster training		14
80. Conduct on-the-job training (OJT)		15
81. Conduct training conferences		16

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 5 OF 29 PAGES

INSTRUCTIONS: RATE EACH TASK BELOW ON ITS REQUIREMENT FOR PHYSICAL STRENGTH AND/OR ENDURANCE.

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9 = Extremely Heavy
X = Don't Know

D. TRAINING (CONTINUED)

	RATE HERE	
82. Construct or develop training materials		17
83. Demonstrate how to locate technical information		18
84. Direct OJT		19
85. Evaluate training		20
86. Interpret policies or directives for subordinates		21
87. Maintain training records		22
88. Obtain training aids, space, or equipment		23
89. Perform emergency medical training such as first aid or cardiopulmonary resuscitation		24
90. Plan or establish OJT programs		25
91. Prepare or revise lesson plans		26
92. Prepare test items		27
93. Prepare workbooks or study guides		28
94. Review training progress of individuals		29
95. Review training status of section		30
96. Rotate duty assignments of personnel		31
97. Schedule formal classroom training		32
98. Schedule OJT		33
99. Score tests		34
100. Select individuals for specialized training		35
101. Select or assign instructors or trainers		36
If you know of a physically demanding task under this duty which does not appear in the list, please add it to the blank pages at the end of the booklet and rate it as you would the other tasks.	XXXXXXXXXXXXXXXX	
	XXXXXXXXXXXXXXXX	
	XXXXXXXXXXXXXXXX	
	XXXXXXXXXXXXXXXX	

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 6 OF 29 PAGES
INSTRUCTIONS: RATE EACH TASK BELOW ON ITS REQUIREMENT FOR PHYSICAL STRENGTH AND/OR ENDURANCE. SCALE REFERENCE POINTS FOR SIMPLE LIFTING REQUIREMENTS WOULD BE: 0 = 0 – 9 lbs; 1 = 10 – 19 lbs; 2 = 20 – 29 lbs; 3 = 30 – 39 lbs; 4 = 40 – 49 lbs; 5 = 50 – 59 lbs; 6 = 60 – 69 lbs; 7 = 70 – 79 lbs; 8 = 80 – 89 lbs; 9 = 90 lbs or more.		RATING SCALE 0 = No Significant Demand 1 = Extremely Light 2 = Very Light 3 = Light 4 = Light to Moderate 5 = Moderate 6 = Moderate to Heavy 7 = Heavy 8 = Very Heavy 9 = Extremely Heavy X = Don't Know
E. PERFORMING ADMINISTRATIVE OR MATERIEL PROCEDURES	RATE HERE	
102. Admit patients to hospitals		37
103. Annotate treatments to patient treatment records		38
104. Answer patient inquiries on the telephone		39
105. Collect statistical data		40
106. Complete Physical Profile Serial Report forms (AF Form 422)		41
107. Coordinate buys of special equipment or medical supplies other than allergy extract with med material and vendors		42
108. Document patient problems for referral to physicians		43
109. Draft correspondence or reports		44
110. Explain medical facility policies to patients		45
111. Initiate or annotate International Certificates of Vaccination forms (PHS-731)		46
112. Initiate requests for official or commercial publications		47
113. Inspect medications to insure they are properly boxed, bottled or labeled		48
114. Instruct patients in filling out patient history forms		49
115. Locate required information in official or commercial publications		50
116. Maintain bulletins, manuals, or publications		51
117. Maintain doctors' files or records		52
118. Maintain facility daily patient logs for other than injuries		53
119. Maintain facility forms levels		54
120. Maintain levels of supplies or medications		55
121. Maintain or file laboratory records or reports		56
122. Maintain outpatient appointment books		57
123. Maintain patient allergy record files		58
124. Order supplies using shopping guides		59
125. Organize or maintain Military Health Records forms (AF Form 2100 series)		60

JOB INVENTOR (Duty – Task List)	AFSC 902X0/912X4	PAGE 7 OF 29 PAGES
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	RATE HERE	
126. Perform periodic inventory of dated biological materials to determine currency		61
127. Perform periodic routine inventories of equipment or supplies		62
128. Prepare Chemistry I forms (SF 546)		63
129. Prepare Chemistry II forms (SF 547)		64
130. Prepare Chemistry III forms (SF 548)		65
131. Prepare Clinical Record-Anesthesia forms (SF 517)		66
132. Prepare Clinical Record-Consultation Sheet forms (SF 513)		67
133. Prepare Clinical Record-Electrocardiographic Record forms (SF 520)		68
134. Prepare Clinical Record-Radiographic Report forms (SF 519)		69
135. Prepare Clinical Record-Tissue Exam forms (SF 515)		70
136. Prepare Custodiar Request/Receipt forms (AF Form 601b)		71
137. Prepare Daily Log of Patients treated for Injuries forms (AF Form 1488)		72
138. Prepare Death Tag forms (AF Form 146)	05:	73
139. Prepare emergency reports, such as injury, animal bite, or poisoning reports		5
140. Prepare Hematology forms (SF 549)		6
141. Prepare Immunohematology forms (SF 556)		7
142. Prepare Laboratory Report Display forms (SF 545)		8
143. Prepare 1050-II Base Supply System Cards (AF Form 1998)		9
144. Prepare Microbiology I forms (SF 553)		10
145. Prepare Microbiology II forms (SF 554)		11
146. Prepare Miscellaneous forms (SF 557)		12
147. Prepare or annotate U.S. Field Medical Card forms (DD Form 1380)		13
148. Prepare or distribute recurring reports		14
149. Prepare or submit daily patient count statistics		15

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 8 OF 29 PAGES

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E. PERFORMING ADMINISTRATIVE OR MATERIEL PROCEDURES (CONTINUED)

	RATE HERE	
150. Prepare Parisitology forms (SF 552)		16
151. Prepare patient allergy records		17
152. Prepare Radiographic Report forms (SF 519a)		18
153. Prepare Report of Medical Examination forms (SF 88)		19
154. Prepare Report of Medical History forms (SF 93)		20
155. Prepare Serology forms (SF 551)		21
156. Prepare Spinal Fluid forms (SF 555)		22
157. Prepare Urinalysis forms (SF 550)		23
158. Process written requests for clinic appointments		24
159. Pull or file medical records		25
160. Retire or dispose of medical records		26
161. Review patient history forms		27
162. Review patient's medical records prior to appointment with physicians		28
163. Schedule patient's appointments in person or by telephone		29
164. Screen medical records for security clearances or reliability programs		30
165. Type correspondence or reports		31
166. Use indexes to locate official publications		32
If you know of a physically demanding task under this duty which does not appear in the list, please add it to the blank pages at the end of the booklet and rate it as you would the other tasks.	XXXXXXXXXXXXXXXX	XXXXX
	XXXXXXXXXXXXXXXX	XXXXX
	XXXXXXXXXXXXXXXX	XXXXX
F. PREPARING FOR NURSING PROCEDURES	XXXXXXXXXXXXXXXX	XXXXX
	XXXXXXXXXXXXXXXX	XXXXX
167. Attach cardiac monitoring leads to patients		33
168. Maintain emergency dr[illegible]ays		34

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 9 OF 29 PAGES

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F. PREPARING FOR NURSING PROCEDURES (CONTINUED)

	RATE HERE	
169. Pour oral medications		35
170. Pour sublingual medications		36
171. Prepare bladder irrigations		37
172. Prepare chemical heating pads		38
173. Prepare cold compresses		39
174. Prepare colostomy irrigations		40
175. Prepare delivery rooms		41
176. Prepare ear irrigations		42
177. Prepare enemas		43
178. Prepare equipment for papanicolaou (pap) smears		44
179. Prepare equipment for spinal punctures		45
180. Prepare eye irrigations		46
181. Prepare gastric irrigations		47
182. Prepare hot compresses		48
183. Prepare hot water bottles		49
184. Prepare ice caps		50
185. Prepare inhalation medications		51
186. Prepare K-pads		52
187. Prepare patients for biopsies		53
188. Prepare patients for cystoscopies		54
189. Prepare patients for minor surgery		55
190. Prepare patients for obsetrical procedures		56
191. Prepare patients for sigmoidoscopies		57
192. Prepare patients for thorancenteses		58

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 10 OF 29 PAGES

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F. PREPARING FOR NURSING PROCEDURES (CONTINUED)

	RATE HERE	
193. Prepare patients for vaginal examinations		59
194. Prepare plaster of paris, cotton, or other materials for fabrication of casts		60
195. Prepare rectal medications		61
196. Prepare throat irrigations		62
197. Prepare vaginal irrigations		63
198. Prepare vaginal medications		64
199. Prepare wound irrigations		65
200. Set up balkin frame equipment for skeltal tractions		66
201. Set up Buck's extension traction		67
202. Set up equipment for biopsies		68
203. Set up equipment for blood gas studies		69
204. Set up equipment for bronchoscopies		70
205. Set up equipment for cardiac monitoring		71
206. Set up equipment for cardioversion		72
207. Set up equipment for central venous pressure	06:	73
208. Set up equipment for cervical tractions		5
209. Set up equipment for closed chest drainage		6
210. Set up equipment for gastroscopies		7
211. Set up equipment for sigmoidoscopies		8
212. Set up equipment for thorancenteses		9
213. Set up intermittent positive pressure breathing (IPPB) equipment		10
214. Set up or assemble equipment for cystoscopies		11
215. Set up or prepare equipment for blood transfusions		12
216. Set up or prepare equipment for catheterization		13

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 11 OF 29 PAGES

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F. PREPARING FOR NURSING PROCEDURES (CONTINUED)

	RATE HERE ↓	
217. Set up or prepare heat cradles		14
218. Set up or prepare tub baths		15
219. Set up stryker frames		16
If you know of a physically demanding task under this duty which does not appear in the list, please add it to the blank pages at the end of the booklet and rate it as you would the other tasks.	XXXXXXXXXXXXXX	XXXX
	XXXXXXXXXXXXXX	XXXX
	XXXXXXXXXXXXXX	XXXX

G. PERFORMING NURSING PROCEDURES OR ASSISTING PHYSICIANS IN DIAGNOSIS OR TREATMENTS

	XXXXXXXXXXXXXX	XXXX
220. Act as chaperone during physical examinations		17
221. Administer bed pans or urinals		18
222. Administer bladder irrigations		19
223. Administer colostomy irrigations		20
224. Administer ear irrigations		21
225. Administer enemas		22
226. Administer eye irrigations		23
227. Administer gavages or lavages		24
228. Administer inhalation medications		25
229. Administer instillation medications		26
230. Administer IPPB therapy		27
231. Administer or monitor intravenous infusions		28
232. Administer patient exercises		29
233. Administer rectal medications		30
234. Administer skin tractions		31
235. Administer sublingual medications		32

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 12 OF 29 PAGES

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G. PERFORMING NURSING PROCEDURES OR ASSISTING PHYSICIANS IN DIAGNOSIS OR TREATMENTS (CONTINUED)

	RATE HERE	
236. Administer throat irrigations		33
237. Administer topical medications		34
238. Administer vaginal irrigations		35
239. Administer vaginal medications		36
240. Administer wound irrigations		37
241. Apply abdominal binders		38
242. Apply arm sling bandages		39
243. Apply Barton's bandages		40
244. Apply Buck's extension tractions		41
245. Apply cervical tractions		42
246. Apply cold by ice caps		43
247. Apply cold by thermal baths		44
248. Apply cold by thermal blankets		45
249. Apply cold by tub bath		46
250. Apply cold compresses		47
251. Apply Cravette bandages		48
252. Apply elastic bandages		49
253. Apply heat by chemical heating pads		50
254. Apply heat by compresses		51
255. Apply heat by electrical heating pads		52
256. Apply heat by heat cradles		53
257. Apply heat by hot water bottles		54
258. Apply heat by K-pads		55
259. Apply heat by thermal blankets		56

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 13 OF 29 PAGES

INSTRUCTIONS: RATE EACH TASK BELOW ON ITS REQUIREMENT FOR PHYSICAL STRENGTH AND/OR ENDURANCE.

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X = Don't Know

G. PERFORMING NURSING PROCEDURES OR ASSISTING PHYSICIANS IN DIAGNOSIS OR TREATMENTS (CONTINUED)

	RATE HERE	
260. Apply plaster casts		57
261. Apply pneumatic splints		58
262. Apply suction to patients		59
263. Apply tape or non-elastic bandages		60
264. Apply Valpeau and modified Valpeau bandages		61
265. Assist in obtaining pap smears		62
266. Assist in performing cystoscopies		63
267. Assist patients with postural drainages		64
268. Assist with biopsies		65
269. Assist with bronchoscopies		66
270. Assist with closed chest drainages		67
271. Assist with deliveries of babies		68
272. Assist with sigmoidoscopies		69
273. Assist with spinal punctures		70
274. Assist with thorancenteses		71
275. Assist with vaginal examinations		72
276. Catherterize patients	07:	73
277. Change dressings		5
278. Clean patient care areas		6
279. Conduct area field visits to identify specific allergens in surrounding areas		7
280. Conduct household inspections to assist patients in avoidance or elimination of allergens		8
281. Consult with physicians on determination of patients' allergy medication		9
282. Counsel patients on allergy injection programs		10
283. Determine specific dosage for allergy patients		11

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 14 OF 29 PAGES

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G. PERFORMING NURSING PROCEDURES OR ASSISTING PHYSICIANS IN DIAGNOSIS OR TREATMENTS (CONTINUED)

	RATE HERE	
284. Dispense medications		12
285. Dispose of contaminated material		13
286. Draw blood from patients for other than serological tests		14
287. Explain treatment or self-care to patients		15
288. Feed babies		16
289. Feed patients		17
290. Give back rubs		18
291. Give skin care		19
292. Identify or care for postoperative hemorrhages		20
293. Identify or initiate emergency treatment for anaphylaxis		21
294. Identify or initiate emergency treatment for syncope		22
295. Identify or initiate emergency treatment for systemic reactions		23
296. Identify or initiate emergency treatment for local reactions		24
297. Identify problems or needs of patients		25
298. Identify signs or symptoms of allergic asthma		26
299. Identify signs or symptoms of allergic rhinitis		27
300. Identify signs or symptoms of chronic bronchitis		28
301. Identify signs or symptoms of insect hypersensitivity		29
302. Identify signs or symptoms of urticaria		30
303. Identify signs or symptoms of vasomotor rhinitis		31
304. Insert oral airways		32
305. Instruct insect sensitive patients on use of emergency treatment kits		33
306. Instruct patients in crutch walking		34
307. Instruct patients on applying environmental methods of allergy controls		35

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 15 OF 29 PAGES

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G. PERFORMING NURSING PROCEDURES OR ASSISTING PHYSICIANS IN DIAGNOSIS OR TREATMENTS (CONTINUED)

	RATE HERE	
308. Instruct patients on exercise methods of allergy controls		36
309. Instruct patients on using diet for allergy controls		37
310. Label specimens		38
311. Make bi-valve cuts in casts		39
312. Measure and record intake and output of patients		40
313. Monitor blood transfusions		41
314. Move or transport patients		42
315. Observe or monitor closed chest drainages		43
316. Observe or report emotional status or needs of patients		44
317. Observe or report on patients in serious or critical condition		45
318. Observe or report on patients recovering from general anesthesia		46
319. Observe reactions of allergy patients after injections		47
320. Obtain blood from blood bank		48
321. Obtain scrapings for cultures from wounds or lesions		49
322. Obtain sputum collections		50
323. Obtain urine or feces specimens		51
324. Participate in team conferences		52
325. Perform cardiopulmonary resuscitation (CPR)		53
326. Perform isolation or reverse isolation techniques		54
327. Perform or assist with gastric washings		55
328. Perform oral hygiene		56
329. Perform post delivery care or procedures for babies		57
330. Perform post mortem care		58
331. Perform postoperative care		59

JOB INVENTORY Duty – Task List	AFSC 902X0/912X4	PAGE 16 OF 29 PAGES

INSTRUCTIONS: RATE EACH TASK BELOW ON ITS REQUIREMENT FOR PHYSICAL STRENGTH AND/OR ENDURANCE.

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G. PERFORMING NURSING PROCEDURES OR ASSISTING PHYSICIANS IN DIAGNOSIS OR TREATMENTS (CONTINUED)

	RATE HERE ▼	
332. Perform preoperative preparations such as scrubs and shaves		60
333. Perform tracheostomy care		61
334. Perform triage during disaster situations		62
335. Perform triage in hospital or clinic		63
336. Perform urine test for sugar and acetone		64
337. Posture or align patients		65
338. Prepare dressing trays		66
339. Prepare items for sterilization		67
340. Prepare oxygen equipment		68
341. Prepare patients for physical examinations		69
342. Prepare patients for X-ray examinations		70
343. Prepare prescribed medications		71
344. Prevent or care for post partum hemorrhages		72
345. Remove plaster casts	08:	73
346. Run electrocardiograph (EKG) tracings		5
347. Take fetal heart tones		6
348. Take or record apical pulse		7
349. Take or record blood pressures		8
350. Take or record body weight		9
351. Take or record radial pulse		10
352. Take or record respirations rate		11
353. Take or record temperatures		12
354. Turn patients manually		13
If you know of a physically demanding task under this duty which does not appear in the list, please add it to the blank pages at the end of the booklet and rate it as you would the other tasks.	XXXXXXXXXXXXXXXXXX	

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 17 OF 29 PAGES

INSTRUCTIONS: RATE EACH TASK BELOW ON ITS REQUIREMENT FOR PHYSICAL STRENGTH AND/OR ENDURANCE.

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H. PREPARING FOR AND ADMINISTERING INJECTIONS

	RATE HERE	
355. Administer coccidioidin (Valley Fever) tests		14
356. Administer histoplasmin tests		15
357. Administer injections using jet injector apparatus		16
358. Administer intradermal injections		17
359. Administer intramuscular injections		18
360. Administer intravenous injections		19
361. Administer Monovac tests		20
362. Administer oral medications		21
363. Administer oral vaccines		22
364. Administer protein purified derivative (PPD) tests		23
365. Administer smallpox vaccinations using scratch techniques		24
366. Administer subcutaneous injections		25
367. Administer Tine tests		26
368. Annotate or update immunization roster machine printouts		27
369. Assemble or disassemble jet injector apparatus		28
370. Compare individual International Certificates of Vaccinations forms with immunization card decks or printouts		29
371. Coordinate with CBPO on problems regarding immunization card decks or machine printouts		30
372. Coordinate with commanders or supervisors regarding no-shows for immunizations		31
373. Counsel patients on routine immunization procedures or effects		32
374. Dispose of needles or syringes using methods such as autoclave, crushing or burning		33
375. Evaluate requests for waiver of immunizations		34
376. Inspect biological refrigerators for proper temperature and utilization		35
377. Interpret results of coccidioidin (Valley Fever) tests		36
378. Interpret results of histoplasmin tests		37

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 18 OF 29 PAGES

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H. PREPARING FOR AND ADMINISTERING INJECTIONS (CONTINUED)

	RATE HERE	
379. Interpret results of Monovac tests		38
380. Interpret results of PPD tests		39
381. Interpret results of Tine tests		40
382. Load medications in jet injector apparatus		41
383. Perform operator maintenance of jet injector apparatus		42
384. Prepare medications for injections		43
385. Pull or annotate immunization cards from card decks		44
386. Record results of coccidioidin (Valley Fever) tests		45
387. Record results of histoplasmin tests		46
388. Record results of Monovac tests		47
389. Record results of PPD tests		48
390. Record results of Tine tests		49
391. Set up intravenous equipment		50
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	XXXXXXXXXXXXXXXX	XXXXX
	XXXXXXXXXXXXXXXX	XXXXX

I. PERFORMING CLINICAL OR EMERGENCY ROOM PROCEDURES

	XXXXXXXXXXXXXXXX	XXXXX
392. Administer primary care at scene of accidents		51
393. Apply Basswood splints		52
394. Apply Hare traction splints		53
395. Apply make-shift splints		54
396. Apply plaster splints		55
397. Apply Thomas leg splints		56

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 19 OF 29 PAGES

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I. PERFORMING CLINICAL OR EMERGENCY ROOM PROCEDURES (CONTINUED)

	RATE HERE	
398. Apply wire ladder splints		57
399. Apply wrap-around splints		58
400. Assemble or maintain physician's emergency or primary care kits		59
401. Assemble or maintain triage treatment kits		60
402. Assist with or treat Thermal or chemical injuries		61
403. Debride wounds		62
404. Dispatch ambulances		63
405. Drive ambulances		64
406. Give local anesthsia		65
407. Incise and drain cysts		66
408. Load or unload ambulance patients		67
409. Perform operator maintenance on government vehicles		68
410. Prepare reports of treatment		69
411. Remove foreign objects from patients using minor surgery		70
412. Remove ingrown toe nails		71
413. Remove moles		72
414. Remove sebaceous cysts	09:	73
415. Remove sutures		5
416. Remove warts		6
417. Restrain patients		7
418. Screen patients at sick call		8
419. Set up instruments or equipment for minor surgery		9
420. Sterilize instruments		10
421. Suture lacerations		11

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 20 OF 29 PAGES

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I. PERFORMING CLINICAL OR EMERGENCY ROOM PROCEDURES (CONTINUED)

	RATE HERE	
422. Take throat cultures		12
If you know of a physically demanding task under this duty which does not appear in the list, please add it to the blank pages at the end of the booklet and rate it as you would the other tasks.	XXXXXXXXXXXXXXXX	XXXX
	XXXXXXXXXXXXXXXX	XXXX
	XXXXXXXXXXXXXXXX	XXXX
J. PERFORMING WARD SERVICES	XXXXXXXXXXXXXXXX	XXXX
	XXXXXXXXXXXXXXXX	XXXX
423. Accompany patients to meet appointments		13
424. Admit or orient patients to wards		14
425. Bathe adults or infants		15
426. Clean delivery rooms		16
427. Clean ward utility areas		17
428. Maintain inpatient health records		18
429. Maintain or process admission, discharge, or release records		19
430. Make beds other than postoperative or recovery		20
431. Make postoperative or recovery beds		21
432. Orient visitors to wards		22
433. Perform terminal disinfection of patient units		23
434. Schedule duties for convalescing patients		24
435. Serve nourishment to patients		25
436. Set up humidifiers or vaporizers		26
437. Turn patients using stryker frames		27
If you know of a physically demanding task under this duty which does not appear in the list, please add it to the blank pages at the end of the booklet and rate it as you would the other tasks.	XXXXXXXXXXXXXXXX	XXXX
	XXXXXXXXXXXXXXXX	XXXX
	XXXXXXXXXXXXXXXX	XXXX

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 21 OF 29 PAGES

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K. PERFORMING AEROMEDICAL EVACUATION FUNCTIONS

	RATE HERE	
438. Annotate patient airlift tags		28
439. Arrange for special diets to accompany air evacuation patients		29
440. Clean or sanitize patient areas in aircraft		30
441. Configure aircraft to receive patients		31
442. Direct evacuation procedures		32
443. Drive ambuses		33
444. Enplane or deplane baggage		34
445. Enplane or deplane patients		35
446. Evaluate needs of patients to be air evacuated		36
447. Identify patient symptoms arising from physiological changes due to flight		37
448. Implement real or simulated survival procedures		38
449. Make up litters		39
450. Obtain medical supplies or equipment for air evacuation		40
451. Operate inflight emergency oxygen systems		41
452. Perform anti-hijack searches of patients		42
453. Perform emergency medical care for patients during ground transportation		43
454. Perform patient care in flight		44
455. Prepare medical equipment or supplies for air evacuation		45
456. Prepare or give preflight patient briefings		46
457. Prepare patient positioning plans		47
458. Prepare patients or equipment for ditchings or crashes		48
459. Prepare psychiatric patients for air evacuation		49
460. Prepare records of medical supplies for air evacuation		50
461. Request air evacuation for patients		51

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 22 OF 29 PAGES

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k. PERFORMING AEROMEDICAL EVACUATION FUNCTIONS (CONTINUED)

	RATE HERE	
462. Screen patients for contraband materials		52
463. Secure or tie down medical equipment on aircraft		53
464. Serve inflight meals		54
If you know of a physically demanding task under this duty which does not appear in the list, please add it to the blank pages at the end of the booklet and rate it as you would the other tasks.	XXXXXXXXXXXXXXX	XXXXX
	XXXXXXXXXXXXXXX	XXXXX
	XXXXXXXXXXXXXXX	XXXXX
L. PERFORMING ALLERGY TESTS AND PROCEDURES	XXXXXXXXXXXXXXX	XXXXX
	XXXXXXXXXXXXXXX	XXXXX
465. Administer conjunctival tests		55
466. Administer intradermal tests		56
467. Administer passive transfer/PK tests		57
468. Administer patch tests		58
469. Administer provocative nasal challenge tests		59
470. Administer pulmonary function tests using electronic spirometers		60
471. Administer pulmonary function tests using mechanical spirometers		61
472. Administer scratch tests		62
473. Draw blood for serological tests		63
474. Interpret results of atmospheric pollen surveys		64
475. Interpret results of conjunctival tests		65
476. Interpret results of intradermal tests		66
477. Interpret results of nasopharyngeal tests for eosinophiles		67
478. Interpret results of orpharyngeal tests for eosinophiles		68
479. Interpret results of passive transfer/PK tests		69
480. Interpret results of patch tests		70

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 23 OF 29 PAGES

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L. PERFORMING ALLERGY TESTS AND PROCEDURES (CONTINUED)

	RATE HERE	
481. Interpret results of provocative nasal challenge tests		71
482. Interpret results of pulmonary function tests		72
483. Interpret results of scratch tests	10:	73
484. Interpret results of sputum tests for eosinophiles		5
485. Obtain nasopharyngeal cultures		6
486. Obtain oropharyngeal cultures		7
487. Perform atmospheric pollen survey using Durham Gravity Slide Samplers		8
488. Perform atmospheric pollen survey using Rotorod Samplers		9
489. Perform nasopharyngeal tests for eosinophiles		10
490. Perform oropharyngeal tests for eosinophiles		11
491. Perform sputum tests for eosinophiles		12
492. Prepare slides for microscopic examination for atmospheric pollen		13
493. Prepare slides for microscopic examination for eosinophiles		14
494. Prepare syringe tray for intradermal tests		15
495. Record results of atmospheric pollen surveys		16
496. Record results of conjunctival tests		17
497. Record results of intradermal tests		18
498. Record results of nasopharyngeal tests for eosinophiles		19
499. Record results of oropharyngeal tests for eosinophiles		20
500. Record results of passive transfer/PK tests		21
501. Record results of patch tests		22
502. Record results of provocative nasal challenge tests		23
503. Record results of pulmonary function tests		24
504. Record results of scratch tests		25

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 24 OF 29 PAGES
INSTRUCTIONS: RATE EACH TASK BELOW ON ITS REQUIREMENT FOR PHYSICAL STRENGTH AND/OR ENDURANCE. SCALE REFERENCE POINTS FOR SIMPLE LIFTING REQUIREMENTS WOULD BE: 0 = 0 – 9 lbs; 1 = 10 – 19 lbs; 2 = 20 – 29 lbs; 3 = 30 – 39 lbs; 4 = 40 – 49 lbs; 5 = 50 – 59 lbs; 6 = 60 – 69 lbs; 7 = 70 – 79 lbs; 8 = 80 – 89 lbs; 9 = 90 lbs or more.		RATING SCALE 0 = No Significant Demand 1 = Extremely Light 2 = Very Light 3 = Light 4 = Light to Moderate 5 = Moderate 6 = Moderate to Heavy 7 = Heavy 8 = Very Heavy 9 = Extremely Heavy X = Don't Know
L. PERFORMING ALLERGY TESTS AND PROCEDURES (CONTINUED)	RATE HERE →	
505. Record results of sputum tests for eosinophiles		26
506. Set up equipment for pulmonary function tests using mechanical spirometers		27
507. Set up equipment for pulmonary function tests using electronic spirometers		28
If you know of a physically demanding task under this duty which does not appear in the list, please add it to the blank pages at the end of the booklet and rate it as you would the other tasks.	XXXXXXXXXXXXXXXXXX	
	XXXXXXXXXXXXXXXXXX	
	XXXXXXXXXXXXXXXXXX	
M. PERFORMING INDEPENDENT DUTY AND TRANSPORTABLE CLINIC FUNCTIONS	XXXXXXXXXXXXXXXXXX	
	XXXXXXXXXXXXXXXXXX	
508. Administer emergency intravenous therapy		29
509. Analyze bacteriological specimens		30
510. Analyze food samples		31
511. Analyze water samples		32
512. Brief personnel on availability of civilian medical care		33
513. Collect bacteriological specimens		34
514. Collect food samples		35
515. Collect water samples		36
516. Compound simple prescriptions		37
517. Conduct sick call		38
518. Construct nasal packs		39
519. Consult or coordinate treatment with civilian physicians		40
520. Consult or coordinate treatment with military physicians		41
521. Coordinate medical activities with site commanders		42
522. Coordinate special treatments or referrals with host base director of medical services		43
523. Coordinate with transportation section for movement of transportable clinics and hospitals		44

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 25 OF 29 PAGES
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M. PERFORMING INDEPENDENT DUTY AND TRANSPORTABLE CLINIC FUNCTIONS (CONTINUED)	RATE HERE →	

524. Direct preventive medicine programs		45
525. Grow cultures		46
526. Identify deceased personnel		47
527. Identify or treat fractures or dislocations		48
528. Inspect food samples		49
529. Inspect non-medical units for safety or health hazards		50
530. Inventory drugs		51
531. Maintain chlorine residual logs		52
532. Maintain logs for bacteria testing of water		53
533. Maintain open airways in emergency situations		54
534. Maintain preventive medicine records or reports		55
535. Maintain ward Alcohol and Narcotic Record forms (AF Form 579)		56
536. Manage emergency dental problems		57
537. Monitor human reliability programs		58
538. Organize or direct insect or rodent control programs		59
539. Organize or direct rabies control programs		60
540. Perform blood analysis		61
541. Perform chlorine residual tests		62
542. Perform emergency criocothyroidotomy		63
543. Perform gastric analyses		64
544. Perform gram stain procedures		65
545. Perform immunization of animals		66
546. Perform intravenous cut downs		67
547. Perform ligation of vessels		68

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 26 OF 29 PAGES

INSTRUCTIONS: RATE EACH TASK BELOW ON ITS REQUIREMENT FOR PHYSICAL STRENGTH AND/OR ENDURANCE.

SCALE REFERENCE POINTS FOR SIMPLE LIFTING REQUIREMENTS WOULD BE:
0 = 0 – 9 lbs; 1 = 10 – 19 lbs; 2 = 20 – 29 lbs; 3 = 30 – 39 lbs; 4 = 40 – 49 lbs;
5 = 50 – 59 lbs; 6 = 60 – 69 lbs; 7 = 70 – 79 lbs; 8 = 80 – 89 lbs; 9 = 90 lbs or more.

RATING SCALE
0 = No Significant Demand
1 = Extremely Light
2 = Very Light
3 = Light
4 = Light to Moderate
5 = Moderate
6 = Moderate to Heavy
7 = Heavy
8 = Very Heavy
9 = Extremely Heavy
X = Don't Know

M. PERFORMING INDEPENDENT DUTY AND TRANSPORTABLE CLINIC FUNCTIONS (CONTINUED)

	RATE HERE	
548. Perform physical examinations		69
549. Perform radiographic studies		70
550. Perform routine urinalyses		71
551. Prepare or maintain Pharmacy Stock Record forms (AF Form 582)		72
552. Prepare remains of deceased personnel	11:	73
553. Prescribe treatments		5
554. Prevent or treat shock		6
555. Process vaginal smears		7
556. Put temporary fillings in teeth		8
557. Set up air transportable clinics or hospitals		9
558. Treat postoperative dental hemorrages		10
If you know of a physically demanding task under this duty which does not appear on the list, please add it to the blank pages at the end of the booklet and rate it as you would the other tasks.	XXXXXXXXXXXXXXXXX	
	XXXXXXXXXXXXXXXXX	
	XXXXXXXXXXXXXXXXX	

N. PREPARING ALLERGY EXTRACTS OR KITS

	XXXXXXXXXXXXXXXXX	
	XXXXXXXXXXXXXXXXX	
559. Assemble allergy extract kits		11
560. Assign number to and log allergy extract prescriptions		12
561. Coordinate purchase of allergy extract with medical materiel and vendors		13
562. Instruct patients on proper care of allergy extracts		14
563. Issue allergy extract kits		15
564. Label allergy extract vials		16
565. Mix patient's full strength allergy extract using weight by volume system		17
566. Mix patient's full strength allergy extract using protein nitrogen units system		18

JOB INVENTORY (Duty – Task List)	AFSC 902X0/912X4	PAGE 27 OF 29 PAGES

INSTRUCTIONS: RATE EACH TASK BELOW ON ITS REQUIREMENT FOR PHYSICAL STRENGTH AND/OR ENDURANCE.

SCALE REFERENCE POINTS FOR SIMPLE LIFTING REQUIREMENTS WOULD BE:
0 = 0 – 9 lbs; 1 = 10 – 19 lbs; 2 = 20 – 29 lbs; 3 = 30 – 39 lbs; 4 = 40 – 49 lbs;
5 = 50 – 59 lbs; 6 = 60 – 69 lbs; 7 = 70 – 79 lbs; 8 = 80 – 89 lbs; 9 = 90 lbs or more.

RATING SCALE
0 = No Significant Demand
1 = Extremely Light
2 = Very Light
3 = Light
4 = Light to Moderate
5 = Moderate
6 = Moderate to Heavy
7 = Heavy
8 = Very Heavy
9 = Extremely Heavy
X = Don't Know

N. PREPARING ALLERGY EXTRACTS OR KITS (CONTINUED)

	RATE HERE	
567. Mix serial dilutions using protein nitrogen units system		19
568. Mix serial dilutions using weight by volume system		20
569. Mix serum compounds for allergy testing		21
570. Mix stock dilutions		22
571. Package allergy extract for shipment between medical facilities		23
572. Prepare allergy extract dosage schedules		24
573. Prepare allergy treatment extracts from dried powders	12:	25
If you know of a physically demanding task under this duty which does not appear in the list, please add it to the blank pages at the end of the booklet and rate it as you would the other tasks.	XXXXXXXXXXXXXXXXXX	

INSTRUCTIONS: RATE EACH TASK BELOW ON ITS REQUIREMENT FOR PHYSICAL STRENGTH AND/OR ENDURANCE. SCALE REFERENCE POINTS FOR SIMPLE LIFTING REQUIREMENTS WOULD BE: 0 = 0 – 9 lbs; 1 = 10 – 19 lbs; 2 = 20 – 29 lbs; 3 = 30 – 39 lbs; 4 = 40 – 49 lbs; 5 = 50 – 59 lbs; 6 = 60 – 69 lbs; 7 = 70 – 79 lbs; 8 = 80 – 89 lbs; 9 = 90 lbs or more. RATE HERE →	RATING SCALE 0 = No Significant Demand 1 = Extremely Light 2 = Very Light 3 = Light 4 = Light to Moderate 5 = Moderate 6 = Moderate to Heavy 7 = Heavy 8 = Very Heavy 9 = Extremely Heavy X = Don't Know ↓

IMPORTANT

If you know of any physically demanding tasks in your career ladder that were not included in the list, please add them to this page and rate them as you would the other tasks. Failure to include all such tasks in the rating system could result in personnel being assigned to the career ladder without sufficient physical capabilities for performing them.

INSTRUCTIONS: RATE EACH TASK BELOW ON ITS REQUIREMENT FOR PHYSICAL STRENGTH AND/OR ENDURANCE.

SCALE REFERENCE POINTS FOR SIMPLE LIFTING REQUIREMENTS WOULD BE:
0 = 0 – 9 lbs; 1 = 10 – 19 lbs; 2 = 20 – 29 lbs; 3 = 30 – 39 lbs; 4 = 40 – 49 lbs;
5 = 50 – 59 lbs; 6 = 60 – 69 lbs; 7 = 70 – 79 lbs; 8 = 80 – 89 lbs; 9 = 90 lbs or more.

RATING SCALE

0 = No Significant Demand
1 = Extremely Light
2 = Very Light
3 = Light
4 = Light to Moderate
5 = Moderate
6 = Moderate to Heavy
7 = Heavy
8 = Very Heavy
9 = Extremely Heavy
X = Don't Know

	RATE HERE ↓

INSTRUCTIONS: RATE EACH TASK BELOW ON ITS REQUIREMENT FOR PHYSICAL STRENGTH AND/OR ENDURANCE. SCALE REFERENCE POINTS FOR SIMPLE LIFTING REQUIREMENTS WOULD BE: 0 = 0 – 9 lbs; 1 = 10 – 19 lbs; 2 = 20 – 29 lbs; 3 = 30 – 39 lbs; 4 = 40 – 49 lbs; 5 = 50 – 59 lbs; 6 = 60 – 69 lbs; 7 = 70 – 79 lbs; 8 = 80 – 89 lbs; 9 = 90 lbs or more. RATE HERE →	RATING SCALE 0 = No Significant Demand 1 = Extremely Light 2 = Very Light 3 = Light 4 = Light to Moderate 5 = Moderate 6 = Moderate to Heavy 7 = Heavy 8 = Very Heavy 9 = Extremely Heavy X = Don't Know

* * * * * * * * * *

Considering your specialty as a whole, about what percentage of all of the work done by first termers would you estimate falls into each category?

Card 99

1. Very Light Work (Includes most administrative and clerical work) . . . . . [ ] % (5-6)

2. Light Work . . . . . [ ] % (7-8)

3. Medium Work . . . . . [ ] % (9-10)

4. Heavy Work . . . . . [ ] % (11-12)

5. Very Heavy Work . . . . . [ ] % (13-14)

Your answers should total . . . . . 100 %

* * * * * * * * * *

STOP -

After you have completed the Background Section, and the Task Ratings (including write-ins if applicable) please check to be sure that all tasks have been rated.

Return completed booklet to CBPO for transmittal to:

AFHRL/OR
Attn: Kentron International Inc.
Brooks AFB, TX 78235

APPENDIX C

QUESTIONNAIE #2

Note: The following is an example of the format for Questionnaire 2. It contains only a few examples of the tasks. Normally Section II contains approximately 100 tasks and Section III contains only 10 tasks.

UNITED STATES AIR FORCE

STRENGTH AND ENDURANCE SURVEY

FIRE PROTECTION CAREER LADDER

AFSCs 57130, 57150, 57170, and 57190

Return completed to CBPO within
10 working days per AFR 35-2

MANPOWER AND PERSONNEL DIVISION
AIR FORCE HUMAN RESOURCES LABORATORY
BROOKS AFB, TEXAS 78235
AUTOVON 240-2847
AFPT 80-571-167

INSTRUCTIONS

We are asking you to complete the following survey so that we can establish standards for tasks in your career field that require large amounts of physical strength and/or endurance. Other supervisory personnel in your field have completed a prior survey identifying physically demanding tasks. We are now requesting that you as a subject matter expert in this career field provide more detailed information on those tasks previously identified as physically demanding. In order to get the most from the survey, we ask that you carefully consider your response to each question.

This survey contains three sections: a brief background information section, an extensive listing of the physically demanding tasks typically performed in your career ladder, and a subset of the most physically demanding tasks. After completing the background information in Section 1, you will be asked to rate each task in Section 2 on two 10-point physical strength and endurance scales. In Section 3, you will be asked specific questions regarding the most demanding activities associated with some of these tasks.

Tasks requiring physical strength and endurance are defined as those involving significant use of the "large" muscle groups in the arms, back, or legs. These would include requirements for lifting, lowering, or carrying heavy or cumbersome objects, pushing or pulling, turning or torquing, or any other demand for frequent or continuous exertion of muscular effort. Specifically, in supplying your ratings for strength and endurance requirements, you will be asked to consider the four types of physical effort shown below. Examples of each type of effort are given.

Type of Physical Effort	Example Activity
Lifting/lowering	• lifting box onto truck or shelf • lowering installed parts from aircraft to floor • shoveling snow, cement, or gravel • climbing support structures or poles
Carrying	• carrying stores of ammunition • carrying can of foam to scene of fire • emptying tires from storage bins
Pushing/pulling	• pushing handsaw • closing or opening hangar doors • dragging hose into position
Torquing/turning	• loosening corroded mounting bolts with wrench • pumping auto jack handle • closing water main

When you consider the overall level of physical strength and endurance required by each task, it is requested that you provide ratings on the basis of:

a. The most demanding aspect of each task. For example, if performing a task requires some light lifting and some heavy lifting, provide ratings based on the higher requirement. In considering the most demanding aspect of each task, also take into account any factors, such as unusual posture, frequency, and duration of sustained work which might contribute to the overall demand level.

b. The level of demand placed on a single individual performing the task. Occasionally a given task will be performed by more than one person. In this case, assume that the workload is shared equally by all members performing (i.e., if a 300-lb object is generally lifted by 3 people, the task demand for a single individual would be 100 lbs).

c. The demands of a normal working day or shift. Do not base your ratings on the exceptional situation of wartime conditions or similar maximum performance exercises. However, if the task is seasonal work, report the activity as it is performed during a normal working shift that occurs during the most demanding season. Do not attempt to spread it over the year in any manner.

d. The level of demand required by the complete task from start to finish. For example, any preliminary activities that are an integral part of the task should be considered in rating the task.

To obtain the maximum response possible, it is requested that you provide your best estimates even though you may not be absolutely certain of the rating. Draw upon your total experience in this AFSC, not just your current job assignment.

Now, begin the background section on the next page. When that is complete, proceed to the task ratings in Sections 2 and 3. Thank you for your cooperation in this survey.

BACKGROUND INFORMATION

Date

Case Control Number (1-4)

PLEASE PRINT INFORMATION REQUESTED AND CHECK APPLICABLE BOXES

NAME (*FIRST, LAST, MI*) (5-22)

DATE OF BIRTH — Year / Month / Day (23-28)

SEX — MALE / FEMALE (29)

GRADE (30)

E1	E2	E3	E4	E5	E6	E7	E8	E9
AB	AMN	A1C	SRA SGT	SSGT	TSGT	MSGT	SMSGT	CMSGT

SOCIAL SECURITY ACCOUNT NUMBER (*SSAN*) (31-39)

TELEPHONE — AREA CODE / DUTY EXTENSION

HEIGHT — FT / IN (40-42)

WEIGHT — LBS (43-45)

PRIMARY AFSC — PREFIX / NUMBER / SUFFIX (46-52)

DUTY AFSC — PREFIX / NUMBER / SUFFIX (53-59)

MAJOR COMMAND (*CHECK ONE*) (60)

A	G	C	E	Y	O	F
AAC	OMAAC	AOCOM	AFAFC	AFCS	AFOSDC	AFLC
M	**H**	**I**	**J**	**K**	**N**	**Q**
AFRES	AFSC	ARPC	ATC	AU	HQ USAF or FLO EXT	MAC
R	**S**	**T**	**B**	**O**	**U**	**X**
PACAF	SAC	TAC	USAFA	USAFE	USAFSS	OTHER UNIT or ORGANIZATION

TOTAL MONTHS IN PRESENT JOB (Card 02: 5-7)

TOTAL MONTHS AT PRESENT BASE (Card 02: 8-10)

TOTAL MONTHS IN DUTY AFSC (Card 02: 11-13)

TOTAL MONTHS IN CAREER FIELD (Card 02: 14-16)

TOTAL MONTHS ACTIVE FEDERAL MILITARY SERVICE (Card 02: 17-19)

NUMBER OF SUBORDINATES WHO REPORT TO YOU DIRECTLY FOR SUPERVISION (Card 02: 20-21)

DURING THE PAST YEAR, HAVE ANY OF YOUR SUBORDINATES EXPERIENCED DIFFICULTY PERFORMING IN THIS CAREER LADDER BECAUSE THE PHYSICAL DEMANDS OF THE JOB EXCEEDED THEIR PHYSICAL STRENGTH OR STAMINA CAPABILITIES? (Card 02: 22) YES / NO

ORGANIZATION (Card 02: 24-73)

BASE OR INSTALLATION (Card 03: 5-41)

PRESENT WORK ASSIGNMENT (*POSITION OR JOB TITLE*) (Card 03: 3-73)

PRIVACY ACT STATEMENT

AUTHORITY: 5 USC Sec 301, AFR 25-2 & EO 9397. DISCLOSURE: COMPLETION OF THE INVENTORY, INCLUDING SSAN, IS MANDATORY. FAILURE TO PROVIDE COMPLETE INFORMATION WILL DETRACT FROM THE AIR FORCE'S CAPABILITY TO FULFILL THE FOLLOWING PURPOSES. PRINCIPAL PURPOSE: DEVELOPMENT OF SCREENING PROCEDURES AND CORRESPONDING JOB REQUIREMENTS FOR PHYSICAL STRENGTH AND STAMINA. ROUTINE USES: PERSONNEL AND OCCUPATIONAL RESEARCH, JOB REDESIGN AND DEVELOPMENT OF TRAINING PROGRAMS.

IMPORTANT INSTRUCTIONS
FOR SECTION 2

Do not continue until you read this page!

In this section, you will find listed on each page four tasks typically performed in your career ladder. First, read the task statement carefully. Then consider the most demanding aspects of that task and rate the strength requirement (write in the far left column) for each type of physical effort (lifting, carrying, etc.). A task may involve one, two, three, or four types of physical effort. Next, rate the endurance requirements in the far right column for the types of effort involved. As a frame of reference for endurance, assume that the task is performed at least once during a normal work shift. If it is typically performed more than once, use the most demanding conditions as the frame of reference. In either case, rate the extent of the endurance requirement for a normal work shift. Finally, add the name and ratings for any other strenuous type of effort not listed.

Here is an example illustrating how to make your ratings. You should supply a rating, ranging from 0 to 9, for each of the eight boxes associated with the four types of physical effort.

Strength Requirement Scale	INSTRUCTIONS	Endurance Requirement Scale
0 – no significant requirement 1 – extremely low 2 – very low 3 – low 4 – low to moderate 5 – moderate 6 – moderate to high 7 – high 8 – very high 9 – extremely high	Rate the task shown below on its requirement for both strength and endurance. Scale reference points for the strength requirement (scale at left) correspond to manipulating weight as follows: 0 = no significant requirement or manipuleting 0–9 lbs; 5 = moderate requirement or manipulating 50–59 lbs; 9 = extremely high requirement or manipuleting 90 lbs or more. Scale reference points for the endurance requirement (scale at right) are as follows: 0 = no significant requirement or brief duretion/few repetitions per work shift; 5 = moderate requirement or moderate duration/some repetitions per shift; 9 = extremely high requirement or long duretion/ many repetitions per shift.	0 – no significant requirement 1 – extremely low 2 – very low 3 – low 4 – low to moderate 5 – moderate 6 – moderate to high 7 – high 8 – very high 9 – extremely high
TYPE OF EFFORT [5] Lifting/Lowering [0] Carrying [2] Pushing/Pulling [6] Torquing/Turning [ ] Other strenuous activity not listed above. SPECIFY: _____	Hypothetical task: Change flat tire on automobile	TYPE OF EFFORT [1] Lifting/Lowering [0] Carrying [0] Pushing/Pulling [1] Torquing/Turning [ ] Other strenuous activity not listed above. SPECIFY: _____

Proceed to Section 2 and supply all task ratings requested.

SECTION 2

Strength Requirement Scale	INSTRUCTIONS	Endurance Requirement Scale
0 – no significant requirement 1 – extremely low 2 – very low 3 – low 4 – low to moderate 5 – moderate 6 – moderate to high 7 – high 8 – very high 9 – extremely high	Rate each task below on its requirement for both strength and endurance. Scale reference points for the strength requirement (scale at left) correspond to manipulating weight as follows: 0 = no significant requirement or manipulating 0–9 lbs; 5 = moderate requirement or manipulating 50–59 lbs; 9 = extremely high requirement or manipulating 90 lbs or more. Scale reference points for the endurance requirement (scale at right) are as follows: 0 = no significant requirement or brief duration/few repetitions per work shift; 5 = moderate requirement or moderate duration/some repetitions per shift; 9 = extremely high requirement or long duration/many repetitions per shift. WRITE YOUR NUMERICAL RATING IN THE APPROPRIATE BOX.	0 – no significant requirement 1 – extremely low 2 – very low 3 – low 4 – low to moderate 5 – moderate 6 – moderate to high 7 – high 8 – very high 9 – extremely high

TYPE OF EFFORT		TYPE OF EFFORT
[5] Lifting/Lowering [4] Carrying [4] Pushing/Pulling [0] Torquing/Turning [ ] Other strenuous activity not listed above. SPECIFY:	A2. Conduct inventories of supplies or equipment	[5] Lifting/Lowering [3] Carrying [4] Pushing/Pulling [0] Torquing/Turning [ ] Other strenuous activity not listed above. SPECIFY:
[5] Lifting/Lowering [4] Carrying [4] Pushing/Pulling [0] Torquing/Turning [ ] Other strenuous activity not listed above. SPECIFY:	B8. Direct aircraft crash fire operations	[0] Lifting/Lowering [4] Carrying [4] Pushing/Pulling [0] Torquing/Turning [ ] Other strenuous activity not listed above. SPECIFY:
[5] Lifting/Lowering [5] Carrying [5] Pushing/Pulling [0] Torquing/Turning [ ] Other strenuous activity not listed above. SPECIFY:	B15. Direct hazardous materials firefighting operations	[0] Lifting/Lowering [4] Carrying [4] Pushing/Pulling [3] Torquing/Turning [ ] Other strenuous activity not listed above. SPECIFY:
[5] Lifting/Lowering [3] Carrying [3] Pushing/Pulling [0] Torquing/Turning [ ] Other strenuous activity not listed above. SPECIFY:	B17. Direct rescue operations	[5] Lifting/Lowering [5] Carrying [5] Pushing/Pulling [0] Torquing/Turning [ ] Other strenuous activity not listed above. SPECIFY:

Have you supplied ratings for all boxes, left and right?

SECTION 2

Strength Requirement Scale	INSTRUCTIONS	Endurance Requirement Scale
0 – no significant requirement 1 – extremely low 2 – very low 3 – low 4 – low to moderate 5 – moderate 6 – moderate to high 7 – high 8 – very high 9 – extremely high	Rate each task below on its requirement for both strength and endurance. Scale reference points for the strength requirement (scale at left) correspond to manipulating weight as follows: 0 = no significant requirement or manipulating 0–9 lbs; 5 = moderate requirement or manipulating 50–59 lbs; 9 = extremely high requirement or manipulating 90 lbs or more. Scale reference points for the endurance requirement (scale at right) are as follows: 0 = no significant requirement or brief duration/few repetitions per work shift; 5 = moderate requirement or moderate duration/some repetitions per shift; 9 = extremely high requirement or long duration/many repetitions per shift. WRITE YOUR NUMERICAL RATING IN THE APPROPRIATE BOX.	0 – no significant requirement 1 – extremely low 2 – very low 3 – low 4 – low to moderate 5 – moderate 6 – moderate to high 7 – high 8 – very high 9 – extremely high

TYPE OF EFFORT		TYPE OF EFFORT
[4] Lifting/Lowering [3] Carrying [4] Pushing/Pulling [0] Torquing/Turning [ ] Other strenuous activity not listed above. SPECIFY:	D4. Conduct "Broken Arrow" or disaster-type drills	[5] Lifting/Lowering [4] Carrying [5] Pushing/Pulling [2] Torquing/Turning [ ] Other strenuous activity not listed above. SPECIFY:
[4] Lifting/Lowering [4] Carrying [1] Pushing/Pulling [2] Torquing/Turning [ ] Other strenuous activity not listed above. SPECIFY:	D8. Conduct egress training from aircraft or buildings	[5] Lifting/Lowering [3] Carrying [3] Pushing/Pulling [1] Torquing/Turning [ ] Other strenuous activity not listed above. SPECIFY:
[4] Lifting/Lowering [4] Carrying [5] Pushing/Pulling [3] Torquing/Turning [ ] Other strenuous activity not listed above. SPECIFY:	D9. Conduct egress training from towers	[5] Lifting/Lowering [4] Carrying [3] Pushing/Pulling [2] Torquing/Turning [ ] Other strenuous activity not listed above. SPECIFY:
[3] Lifting/Lowering [3] Carrying [3] Pushing/Pulling [0] Torquing/Turning [ ] Other strenuous activity not listed above. SPECIFY:	D11. Conduct first aid training	[0] Lifting/Lowering [3] Carrying [3] Pushing/Pulling [0] Torquing/Turning [ ] Other strenuous activity not listed above. SPECIFY:

Have you supplied ratings for all boxes, left and right?

IMPORTANT INSTRUCTIONS
FOR SECTION 3

DO NOT CONTINUE UNTIL YOU READ THIS PAGE!

The questions in this section are different from those you just answered in Section 2. In this section, you must think of specific types of demanding ACTIVITIES associated with some of the tasks you just rated.

Read carefully the instructions that follow and work through the example.

In this section you will find a subset of the most physically demanding tasks typically performed in your career ladder. Accompanying each task is a standard set of questions for you to answer. The questions relate to the four types of physical effort considered in Section 2, that is, lift/lower, push/pull, carry, and turn/torque. As you answer the questions in this section, keep in mind these important and especially relevant instructions.

a. If tools and/or equipment are involved in the activity, base your answers on the effort expended by the airman while using the tools/equipment. In other words, separate "man effort" from "machine effort."

b. If the task is also performed by others in your AFSC in a "specialty shop" (that is, a tire shop, engine depot, etc.), answer the questions in terms of whichever job is more physically demanding.

c. Because the questions in this section must apply to all AFSCs, they may not address yours perfectly. For that reason, we have provided a place for REMARKS at the end of the section so that you may supply any additional information you deem appropriate.

An example illustrating how to analyze a task and record your answers follows. First, you decide if the task requires lifting or lowering. If so, imagine all the possible lift/lower activities involved and then select the most demanding one to use in answering the questions related to lifting and lowering. If not, go on to the next category of physical effort, i.e., push/pull. Repeat this process until you have covered all four categories.

HYPOTHETICAL TASK: Change flat tire on automobile

Category 1. LIFT OR LOWER Activity. Think about the things you may lift or lower in changing a flat tire. Some are as follows:

- lifting the spare tire out of the trunk
- lowering the spare tire from the trunk to the ground
- lifting the spare tire onto the lug bolts
- lifting the flat tire into the trunk
- pumping the jack handle

The most physically demanding of these is judged to be lifting the spare tire onto the lug bolts since it involves a stooped posture and holding the tire while positioning it on the lug bolts. So the lift/lower category may be filled out as follows:

CATEGORY 1: LIFT OR LOWER ACTIVITIES

DOES THIS TASK REQUIRE LIFTING OR LOWERING?

☒ YES → COMPLETE THIS SECTION

☐ NO → GO TO CATEGORY 2

1a. TYPE
Which choice best describes the most demanding lift or lower activity in this task?
MARK ONLY ONE ANSWER

1 ☐ lift: 1 hand
2 ☒ lift: 2 hands
3 ☐ lower: 1 hand
4 ☐ lower: 2 hands

1b. REPETITION
If the activity is repeated to complete the task, how many repetitions are there? If the task takes more than one day, give the repetitions for one day.

1 ☒ no repetitions
2 ☐ 1-2 repetitions
3 ☐ 3-4 repetitions
4 ☐ 5-8 repetitions
5 ☐ 9-15 repetitions
6 ☐ 16-30 repetitions
7 ☐ 31-60 repetitions
8 ☐ 61-100 repetitions
9 ☐ 101-200 repetitions
10 ☐ more than 200

1c. RATE
What rate best describes how often the lift or lower activity is repeated?

1 ☒ not repeated
2 ☐ 1-2 times per minute
3 ☐ 3-4 times per minute
4 ☐ 5-8 times per minute
5 ☐ 9-15 times per minute
6 ☐ 16-30 times per minute
7 ☐ 31-45 times per minute
8 ☐ 46-60 times per minute
9 ☐ 61-75 times per minute
10 ☐ more than 75 times per minute

1d. WEIGHT
What weight or "share" of the weight must one airman usually lift or lower each time?

1 ☐ 0-14 lbs
2 ☐ 15-29 lbs
3 ☐ 30-44 lbs
4 ☒ 45-59 lbs
5 ☐ 60-74 lbs
6 ☐ 75-89 lbs
7 ☐ 90-104 lbs
8 ☐ 105-119 lbs
9 ☐ 120 lbs or more

1e. BODY POSTURE
What is the usual posture one assumes while performing the lift or lower activity?

1 ☐ standing
2 ☐ sitting
3 ☐ crawling
4 ☐ lying
5 ☐ kneeling
6 ■ stooping (bending knees)
7 ☐ bending at waist
8 ☐ swimming

1f. POSITION
As the airman grips the object to be lifted or lowered, how far is the point of his/her grip from the floor (or other surface that is supporting the airman)?

1 ☐ more than 2 ft below surface
2 ☐ 1-2 ft below the surface
3 ☐ surface level to 1 ft below
4 ☒ surface level to 1 ft above
5 ☐ 1-2 ft above the surface
6 ☐ 3-4 ft above the surface
7 ☐ 5-6 ft above the surface
8 ☐ 7 ft or more above surface

1g. DISTANCE
What is the approximate distance the object is lifted or lowered?

1 ☐ less than 1 ft
2 ■ 1 ft
3 ☐ 2 ft
4 ☐ 3 ft
5 ☐ 4 ft
6 ☐ 5 ft
7 ☐ 6 ft
8 ☐ 7 ft
9 ☐ 8 ft
10 ☐ 9 ft or more

1h. HOLDING TIME
How long is the load held in a stationary position during the lift or lower activity?

1 ☐ 0-15 sec
2 ☒ 16-30 sec
3 ☐ 31-45 sec
4 ☐ 46-60 sec
5 ☐ 1-1½ min
6 ☐ 1½-2 min
7 ☐ 2-2½ min
8 ☐ 2½-3 min
9 ☐ more than 3 min

Note: Since the spare tire is lifted onto the lug bolts only once, the activity is not repeated, and the answer to question 1b is "1 ☒ no repetitions." Likewise, since the activity is not repeated, the answer to question 1c is "1 ☒ not repeated."

Category 2. CARRY

Carrying tools is judged to be the most demanding carry activity. Category 2 would be filled out as follows:

CATEGORY 2: CARRY ACTIVITIES

DOES THIS TASK REQUIRE CARRYING?

☑ YES → COMPLETE THIS SECTION

☐ NO GO TO CATEGORY ≤3

2a. TYPE
Which choice best describes the way the most demanding carry activity is performed?
1 ☒ with 1 hand, object at side of body
2 ☐ with 2 hands, object in front of body
3 ☐ with 1 hand, object over (or on) shoulder(s)
4 ☐ with 2 hands, object over (or on) shoulder(s)
5 ☐ object carried on person's back

2b. REPETITION
If the activity is repeated to complete the task, how many repetitions are there? If the task takes more than one day, give the repetitions for one day.
1 ☐ no repetitions
2 ■ 1-2 repetitions
3 ☐ 3-4 repetitions
4 ☐ 5-8 repetitions
5 ☐ 9-15 repetitions
6 ☐ 16-30 repetitions
7 ☐ 31-60 repetitions
8 ☐ 61-100 repetitions
9 ☐ 101-200 repetitions
10 ☐ more than 200

2c. RATE
What rate best describes how often the carry activity is repeated?
1 ☐ not repeated
2 ☒ 1-5 times per hour
3 ☐ 6-10 times per hour
4 ☐ 11-20 times per hour
5 ☐ 21-30 times per hour
6 ☐ 1-5 times per minute
7 ☐ 6-10 times per minute
8 ☐ 11-20 times per minute
9 ☐ 21-30 times per minute

2d. WEIGHT
What weight or "share" of the weight must one airman usually carry?
1 ☒ 0-14 lbs
2 ☐ 15-29 lbs
3 ☐ 30-44 lbs
4 ☐ 45-59 lbs
5 ☐ 60-74 lbs
6 ☐ 75-89 lbs
7 ☐ 90-104 lbs
8 ☐ 105-119 lbs
9 ☐ 120 lbs or more

2e. MOVEMENT
What is the usual body movement when one performs the carry activity?
1 ☒ walking
3 ☐ running
3 ☐ crawling
4 ☐ stooping (bending knees)
5 ☐ bending at waist
6 ☐ swimming

2f. DIRECTION
What is the usual direction one moves while performing the carry activity?
1 ■ forward
2 ☐ sideways
3 ☐ backward
4 ☐ swimming

2g. LOCATION
Which best describes how the carry activity is usually performed?
1 ☐ ascending or descending stairs
2 ☐ ascending or descending a ladder
3 ☐ ascending or descending a ramp
4 ☐ ascending or descending a pole
5 ☒ on a flat surface
6 ☐ swimming

2h. DISTANCE
What is the total distance the object is usually carried?
1 ☐ 0-1 ft
2 ☐ 2-3 ft
3 ■ 4-5 ft
4 ☐ 6-10 ft
5 ☐ 11-50 ft
6 ☐ 51-100 ft
7 ☐ 101-500 ft
8 ☐ 501-1000 ft
9 ☐ more than 1000 ft

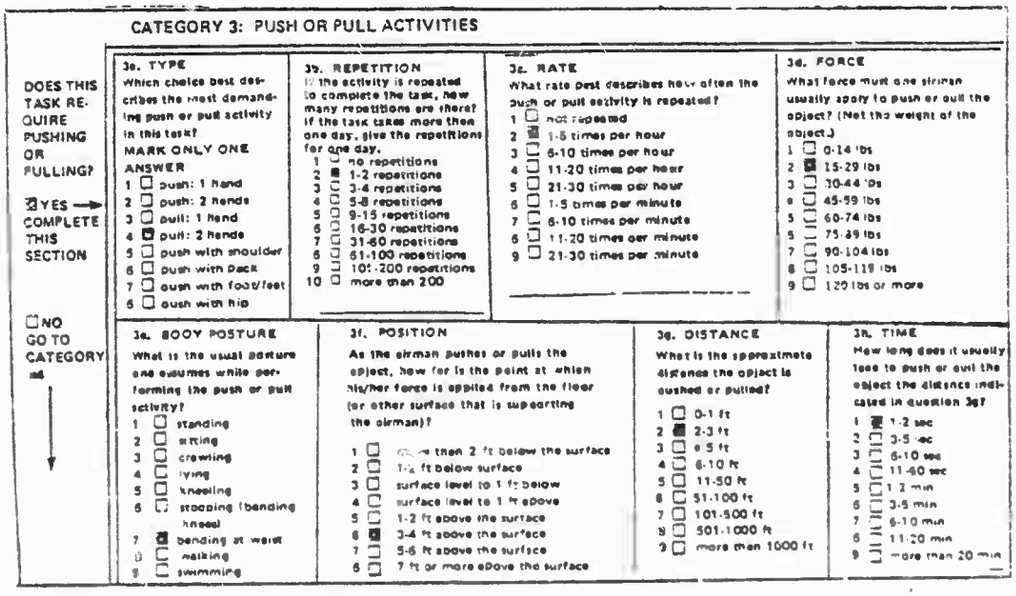
2i. TIME
How long does it usually take to carry the object the distance indicated in question 2h?
1 ☐ 1-2 sec
2 ■ 3-5 sec
3 ☐ 6-10 sec
4 ☐ 11-60 sec
5 ☐ 1-2 min
6 ☐ 3-5 min
7 ☐ 6-10 min
8 ☐ 11-20 min
9 ☐ more than 20 min

Note: Since the tools are carried from the trunk of the car to the tire and then back again, the carry activity is repeated, and the answer to question 2b is "2 ■ 1-2 repetitions." Likewise, since the activity is repeated, the answer to question 2c is "2 ■ 1-5 times per hour."

Category 3. PUSH OR PULL. Activities could include:

- pulling flat tire off lug bolts
- pushing (rolling) tire along surface
- pulling spare tire out of stored position

Pulling spare tire out of stored position is judged to be the most demanding activity. Category 3 would be filled out as follows:



CATEGORY 3: PUSH OR PULL ACTIVITIES

DOES THIS TASK REQUIRE PUSHING OR PULLING?

☒ YES → COMPLETE THIS SECTION

☐ NO GO TO CATEGORY 4

3a. TYPE
Which choice best describes the most demanding push or pull activity in this task?
MARK ONLY ONE ANSWER
1 ☐ push: 1 hand
2 ☐ push: 2 hands
3 ☐ pull: 1 hand
4 ☒ pull: 2 hands
5 ☐ push with shoulder
6 ☐ push with back
7 ☐ push with foot/feet
8 ☐ push with hip

3b. REPETITION
If the activity is repeated to complete the task, how many repetitions are there? If the task takes more than one day, give the repetitions for one day.
1 ☐ no repetitions
2 ■ 1-2 repetitions
3 ☐ 3-4 repetitions
4 ☐ 5-8 repetitions
5 ☐ 9-15 repetitions
6 ☐ 16-30 repetitions
7 ☐ 31-60 repetitions
8 ☐ 61-100 repetitions
9 ☐ 101-200 repetitions
10 ☐ more than 200

3c. RATE
What rate best describes how often the push or pull activity is repeated?
1 ☐ not repeated
2 ■ 1-5 times per hour
3 ☐ 6-10 times per hour
4 ☐ 11-20 times per hour
5 ☐ 21-30 times per hour
6 ☐ 1-5 times per minute
7 ☐ 6-10 times per minute
8 ☐ 11-20 times per minute
9 ☐ 21-30 times per minute

3d. FORCE
What force must one airman usually apply to push or pull the object? (Not the weight of the object.)
1 ☐ 0-14 lbs
2 ☒ 15-29 lbs
3 ☐ 30-44 lbs
4 ☐ 45-59 lbs
5 ☐ 60-74 lbs
6 ☐ 75-89 lbs
7 ☐ 90-104 lbs
8 ☐ 105-119 lbs
9 ☐ 120 lbs or more

3e. BODY POSTURE
What is the usual posture one assumes while performing the push or pull activity?
1 ☐ standing
2 ☐ sitting
3 ☐ crawling
4 ☐ lying
5 ☐ kneeling
6 ☐ stooping (bending knees)
7 ☒ bending at waist
8 ☐ walking
9 ☐ swimming

3f. POSITION
As the airman pushes or pulls the object, how far is the point at which his/her force is applied from the floor (or other surface that is supporting the airman)?
1 ☐ more than 2 ft below the surface
2 ☐ 1-2 ft below surface
3 ☐ surface level to 1 ft below
4 ☐ surface level to 1 ft above
5 ☐ 1-2 ft above the surface
6 ☒ 3-4 ft above the surface
7 ☐ 5-6 ft above the surface
8 ☐ 7 ft or more above the surface

3g. DISTANCE
What is the approximate distance the object is pushed or pulled?
1 ☐ 0-1 ft
2 ■ 2-3 ft
3 ☐ 4-5 ft
4 ☐ 6-10 ft
5 ☐ 11-50 ft
6 ☐ 51-100 ft
7 ☐ 101-500 ft
8 ☐ 501-1000 ft
9 ☐ more than 1000 ft

3h. TIME
How long does it usually take to push or pull the object the distance indicated in question 3g?
1 ■ 1-2 sec
2 ☐ 3-5 sec
3 ☐ 6-10 sec
4 ☐ 11-60 sec
5 ☐ 1-2 min
6 ☐ 3-5 min
7 ☐ 6-10 min
8 ☐ 11-20 min
9 ☐ more than 20 min

Category 4. TORQUE OR TURN

Removing lug nuts is judged to be the most demanding torque/turn activity. Category 4 would be filled out as follows:

CATEGORY 4: TORQUE OR TURN ACTIVITIES

DOES THIS TASK REQUIRE TORQUING OR TURNING?

☒ YES → COMPLETE THIS SECTION

☐ NO

NOW GO TO GENERAL TASK INFORMATION

4a. TYPE
Which choice best describes the most demanding torque or turn activity in this task?
MARK ONLY ONE ANSWER
1 ☐ 1 hand on lever
2 ☒ 2 hands on lever
3 ☐ 1 hand on wheel or knob
4 ☐ 2 hands on wheel or knob
5 ☐ 1 hand on crank
6 ☐ 2 hands on crank
7 ☐ 1 hand on handle
8 ☐ 2 hands on handle

4b. REPETITION
If the activity is repeated to complete the task, how many repetitions are there? If the task takes more than one day, give the repetitions for one day.
1 ☐ no repetitions
2 ☐ 1-2 repetitions
3 ☐ 3-4 repetitions
4 ☒ 5-8 repetitions
5 ☐ 9-15 repetitions
6 ☐ 16-30 repetitions
7 ☐ 31-60 repetitions
8 ☐ 61-100 repetitions
9 ☐ 101-200 repetitions
10 ☐ more than 200

4c. RATE
What rate best describes how often the torque or turn activity is repeated?
1 ☐ not repeated
2 ☐ 1-2 times per minute
3 ☒ 3-4 times per minute
4 ☐ 5-8 times per minute
5 ☐ 9-15 times per minute
6 ☐ 16-30 times per minute
7 ☐ 31-45 times per minute
8 ☐ 46-60 times per minute
9 ☐ 61-75 times per minute
10 ☐ more than 75 times per minute

4d. FORCE
What force must one airman usually apply to do this torque or turn activity?
1 ☐ 0-9 lbs
2 ☐ 10-19 lbs
3 ☐ 20-29 lbs
4 ☐ 30-39 lbs
5 ☐ 40-49 lbs
6 ☐ 50-59 lbs
7 ☐ 60-69 lbs
8 ☐ 70-79 lbs
9 ☐ 80 lbs or more

4e. BODY POSTURE
What is the usual posture one assumes while performing the torque or turn activity?
1 ☐ standing
2 ☐ sitting
3 ☐ lying
4 ☐ kneeling
5 ☒ stooping (bending knees)
6 ☐ bending at waist
7 ☐ walking
8 ☐ swimming

4f. POSITION
As the airman grips the object to be torqued or turned, how far is the point of his/her grip from the floor?
1 ☐ more than 2 ft below the surface
2 ☐ 1-2 ft below the surface
3 ☐ surface level to 1 ft below
4 ☐ surface level to 1 ft above
5 ☐ 1-2 ft above the surface
6 ☐ 3-4 ft above the surface
7 ☐ 5-6 ft above the surface
8 ☐ 7 ft or more above the surface

4g. DISTANCE
What is the length of the radius of the object being turned?
1 ☐ 0-2 in
2 ☐ 3-5 in
3 ☐ 6-8 in
4 ☐ 9-12 in
5 ☐ 13-24 in
6 ☐ 25-36 in
7 ☐ 37-48 in
8 ☐ 49-60 in
9 ☐ more than 60 in

4h. REVOLUTIONS
How many revolutions does it take to complete the torque or turn activity?
1 ☐ 0-1/2 revolution
2 ☐ 1/2-1 revolution
3 ☐ 2-4 revolutions
4 ☐ 5-9 revolutions
5 ☒ 10-24 revolutions
6 ☐ 25-49 revolutions
7 ☐ 50-99 revolutions
8 ☐ 100-199 revolutions
9 ☐ 200 revolutions or more

4i. TIME
How long does it usually take to make the number of revolutions indicated in question 4h?
1 ☐ 1-2 sec
2 ☐ 3-5 sec
3 ☐ 6-10 sec
4 ☐ 11-20 sec
5 ☐ 21-40 sec
6 ☐ 41-60 sec
7 ☐ 1-2 min
8 ☐ 3-5 min
9 ☐ 6 min or more

Answer the following general questions for the task as a whole, considering all activities typically performed in accomplishing the task.

GENERAL TASK INFORMATION

ANSWER THESE QUESTIONS FOR THIS TASK

5a. TIME
What is the approximate time usually required to complete this entire TASK from start to finish?
1 ☒ 1/2 hr or less
2 ☐ 1 hr
3 ☐ 2 hr
4 ☐ 3 hr
5 ☐ 4 hr
6 ☐ 8 hr (one shift)
7 ☐ 2 shifts
8 ☐ 3 or more shifts

5b. PERCENT PERFORMING
Approximately what percent of the airmen in your AFSC perform this task?
01 %

5c. PERCENT TIME
What percent of the airman's man-hours is spent performing this task?
01 %

5d. ENVIRONMENT
What percent of the time is this task performed in each of the following environments? (Fill in all boxes.)
25 % indoors
75 % outdoors
00 % sunlight
100 % TOTAL

5e. MANPOWER
How many airmen usually work together as a team to accomplish this task?
01 airmen

5f. FREQUENCY
How often is this task usually performed? (Write in times per day, per week, OR per month.)
0 times per day
0 times per week
001 times per month

Please begin now to complete the task evaluations that follow. Thank you for your cooperation.

SECTION 3

INSTRUCTIONS

Carefully read the task shown at right. Then, for each category of physical effort shown below (lift/lower, push/pull, carry, and torque/turn), select the single most demanding activity and answer the questions for that activity only. Do not change the activity while answering questions within a category. As a general rule, answer the questions for a normal working day or shift and not the exceptional situation, such as wartime. If tools/equipment are involved, answer in terms of effort expended by the airman in using same. Remember, these are just a few of the demanding tasks in your AFSC. BLACKEN THE APPROPRIATE BOX TO INDICATE YOUR ANSWER.

M20. Rescue personnel from motor vehicles

CATEGORY 1: LIFT OR LOWER ACTIVITIES

DOES THIS TASK REQUIRE LIFTING OR LOWERING?

☐ YES → COMPLETE THIS SECTION

☒ NO → GO TO CATEGORY #2

1a. TYPE — Which choice best describes the most demanding lift or lower activity in this task? MARK ONLY ONE ANSWER

1 ☐ lift: 1 hand
2 ☐ lift: 2 hands
3 ☐ lower: 1 hand
4 ☐ lower: 2 hands

1b. REPETITION — If the activity is repeated to complete the task, how many repetitions are there? If the task takes more than one day, give the repetitions for one day.

1 ☐ no repetitions
2 ☐ 1-2 repetitions
3 ☐ 3-4 repetitions
4 ☐ 5-8 repetitions
5 ☐ 9-15 repetitions
6 ☐ 16-30 repetitions
7 ☐ 31-60 repetitions
8 ☐ 61-100 repetitions
9 ☐ 101-200 repetitions
10 ☐ more than 300

1c. RATE — What rate best describes how often the lift or lower activity is repeated?

1 ☐ not repeated
2 ☐ 1-2 times per minute
3 ☐ 3-4 times per minute
4 ☐ 5-8 times per minute
5 ☐ 9-15 times per minute
6 ☐ 16-30 times per minute
7 ☐ 31-45 times per minute
8 ☐ 46-60 times per minute
9 ☐ 61-75 times per minute
10 ☐ more than 75 times per minute

1d. WEIGHT — What weight or "share" of the weight must one airman usually lift or lower each time?

1 ☐ 0-14 lbs
2 ☐ 15-29 lbs
3 ☐ 30-44 lbs
4 ☐ 45-59 lbs
5 ☐ 60-74 lbs
6 ☐ 75-89 lbs
7 ☐ 90-104 lbs
8 ☐ 105-119 lbs
9 ☐ 120 lbs or more

1e. BODY POSTURE — What is the usual posture one assumes while performing the lift or lower activity?

1 ☐ standing
2 ☐ sitting
3 ☐ crawling
4 ☐ lying
5 ☐ kneeling
6 ☐ stooping (bending knees)
7 ☐ bending at waist
8 ☐ swimming

1f. POSITION — As the airman grips the object to be lifted or lowered, how far is the point of his/her grip from the floor (or other surface that is supporting the airman)?

1 ☐ more than 2 ft below surface
2 ☐ 1-2 ft below the surface
3 ☐ surface level to 1 ft below
4 ☐ surface level to 1 ft above
5 ☐ 1-2 ft above the surface
6 ☐ 3-4 ft above the surface
7 ☐ 5-6 ft above the surface
8 ☐ 7 ft or more above surface

1g. DISTANCE — What is the approximate distance the object is lifted or lowered?

1 ☐ less than 1 ft
2 ☐ 1 ft
3 ☐ 2 ft
4 ☐ 3 ft
5 ☐ 4 ft
6 ☐ 5 ft
7 ☐ 6 ft
8 ☐ 7 ft
9 ☐ 8 ft
10 ☐ 9 ft or more

1h. HOLDING TIME — How long is the load held in a stationary position during the lift or lower activity?

1 ☐ 0-15 sec
2 ☐ 16-30 sec
3 ☐ 31-45 sec
4 ☐ 46-60 sec
5 ☐ 1-1½ min
6 ☐ 1½-2 min
7 ☐ 2-2½ min
8 ☐ 2½-3 min
9 ☐ more than 2 min

CATEGORY 2: CARRY ACTIVITIES

DOES THIS TASK REQUIRE CARRYING?

☐ YES → COMPLETE THIS SECTION

☒ NO → GO TO CATEGORY #3

2a. TYPE — Which choice best describes the way the most demanding carry activity is performed?

1 ☐ with 1 hand, object at side of body
2 ☐ with 2 hands, object in front of body
3 ☐ with 1 hand, object over (or on) shoulder(s)
4 ☐ with 2 hands, object over (or on) shoulder(s)
5 ☐ object carried on person's back

2b. REPETITION — If the activity is repeated to complete the task, how many repetitions are there? If the task takes more than one day, give the repetitions for one day.

1 ☐ no repetitions
2 ☐ 1-3 repetitions
3 ☐ 2-4 repetitions
4 ☐ 5-8 repetitions
5 ☐ 9-15 repetitions
6 ☐ 16-30 repetitions
7 ☐ 31-60 repetitions
8 ☐ 61-100 repetitions
9 ☐ 101-200 repetitions
10 ☐ more than 200

2c. RATE — What rate best describes how often the carry activity is repeated?

1 ☐ not repeated
2 ☐ 1-5 times per hour
3 ☐ 6-10 times per hour
4 ☐ 11-30 times per hour
5 ☐ 31-20 times per hour
6 ☐ 1-5 times per minute
7 ☐ 6-10 times per minute
8 ☐ 11-30 times per minute
9 ☐ 21-30 times per minute

2d. WEIGHT — What weight or "share" of the weight must one airman usually carry?

1 ☐ 0-14 lbs
2 ☐ 15-29 lbs
3 ☐ 30-44 lbs
4 ☐ 45-59 lbs
5 ☐ 60-74 lbs
6 ☐ 75-89 lbs
7 ☐ 90-104 lbs
8 ☐ 105-119 lbs
9 ☐ 120 lbs or more

2e. MOVEMENT — What is the usual body movement when one performs the carry activity?

1 ☐ walking
2 ☐ running
3 ☐ crawling
4 ☐ stooping (bending knees)
5 ☐ bending at waist
6 ☐ swimming

2f. DIRECTION — What is the usual direction one moves while performing the carry activity?

1 ☐ forward
3 ☐ sideways
2 ☐ backward
4 ☐ swimming

2g. LOCATION — Which best describes how the carry activity is usually performed?

1 ☐ ascending or descending stairs
2 ☐ ascending or descending a ladder
3 ☐ ascending or descending a ramp
4 ☐ ascending or descending a slope
5 ☐ on a flat surface
6 ☐ swimming

2h. DISTANCE — What is the total distance the object is usually carried?

1 ☐ 0-1 ft
2 ☐ 2-3 ft
3 ☐ 4-5 ft
4 ☐ 6-10 ft
5 ☐ 11-30 ft
6 ☐ 31-100 ft
7 ☐ 101-500 ft
8 ☐ 501-1000 ft
9 ☐ more than 1000 ft

2i. TIME — How long does it usually take to carry the object the distance indicated in question 2h?

1 ☐ 0-5 sec
2 ☐ 6-15 sec
3 ☐ 16-30 sec
4 ☐ 31-60 sec
5 ☐ 1-2 min
6 ☐ 2-5 min
7 ☐ 6-10 min
8 ☐ 11-20 min
9 ☐ more than 20 min

CATEGORY 3: PUSH OR PULL ACTIVITIES

DOES THIS TASK REQUIRE PUSHING OR PULLING?

☐ YES → COMPLETE THIS SECTION

☐ NO → GO TO CATEGORY 4

3a. TYPE
Which choice best describes the most demanding push or pull activity in this task?
MARK ONLY ONE ANSWER
1 ☐ push: 1 hand
2 ☐ push: 2 hands
3 ☐ pull: 1 hand
4 ☐ pull: 2 hands
5 ☐ push with shoulder
6 ☐ push with back
7 ☐ push with foot/feet
8 ☐ push with hip

3b. REPETITION
If the activity is repeated to complete the task, how many repetitions are there? If the task takes more than one day, give the repetitions for one day.
1 ☐ no repetitions
2 ☐ 1-2 repetitions
3 ☐ 3-4 repetitions
4 ☐ 5-8 repetitions
5 ☐ 9-15 repetitions
6 ☐ 16-30 repetitions
7 ☐ 31-60 repetitions
8 ☐ 61-100 repetitions
9 ☐ 101-200 repetitions
10 ☐ more than 200

3c. RATE
What rate best describes how often the push or pull activity is repeated?
1 ☐ not repeated
2 ☐ 1-5 times per hour
3 ☐ 6-10 times per hour
4 ☐ 11-20 times per hour
5 ☐ 21-30 times per hour
6 ☐ 1-5 times per minute
7 ☐ 6-10 times per minute
8 ☐ 11-20 times per minute
9 ☐ 21-30 times per minute

3d. FORCE
What force must one airman usually apply to push or pull the object? (Not the weight of the object.)
1 ☐ 0-14 lbs
2 ☐ 15-29 lbs
3 ☐ 30-44 lbs
4 ☐ 45-59 lbs
5 ☐ 60-74 lbs
6 ☐ 75-89 lbs
7 ☐ 90-104 lbs
8 ☐ 105-119 lbs
9 ☐ 120 lbs or more

3e. BODY POSTURE
What is the usual posture one assumes while performing the push or pull activity?
1 ☐ standing
2 ☐ sitting
3 ☐ crawling
4 ☐ lying
5 ☐ kneeling
6 ☐ stooping (bending knees)
7 ☐ bending at waist
8 ☐ walking
9 ☐ swimming

3f. POSITION
As the airman pushes or pulls the object, how far is the point at which his/her force is applied from the floor (or other surface that is supporting the airman)?
1 ☐ more than 2 ft below the surface
2 ☐ 1-2 ft below surface
3 ☐ surface level to 1 ft below
4 ☐ surface level to 1 ft above
5 ☐ 1-2 ft above the surface
6 ☐ 3-4 ft above the surface
7 ☐ 5-6 ft above the surface
8 ☐ 7 ft or more above the surface

3g. DISTANCE
What is the approximate distance the object is pushed or pulled?
1 ☐ 0-1 ft
2 ☐ 2-3 ft
3 ☐ 4-5 ft
4 ☐ 6-10 ft
5 ☐ 11-50 ft
6 ☐ 51-100 ft
7 ☐ 101-500 ft
8 ☐ 501-1000 ft
9 ☐ more than 1000 ft

3h. TIME
How long does it usually take to push or pull the object the distance indicated in question 3g?
1 ☐ 1-2 sec
2 ☐ 3-5 sec
3 ☐ 6-10 sec
4 ☐ 11-60 sec
5 ☐ 1-2 min
6 ☐ 3-5 min
7 ☐ 6-10 min
8 ☐ 11-20 min
9 ☐ more than 20 min

CATEGORY 4: TORQUE OR TURN ACTIVITIES

DOES THIS TASK REQUIRE TORQUING OR TURNING?

☐ YES → COMPLETE THIS SECTION

☐ NO → NOW GO TO GENERAL TASK INFORMATION

4a. TYPE
Which choice best describes the most demanding torque or turn activity in this task?
MARK ONLY ONE ANSWER
1 ☐ 1 hand on lever
2 ☐ 2 hands on lever
3 ☐ 1 hand on wheel or knob
4 ☐ 2 hands on wheel or knob
5 ☐ 1 hand on crank
6 ☐ 2 hands on crank
7 ☐ 1 hand on handle
8 ☐ 2 hands on handle

4b. REPETITION
If the activity is repeated to complete the task, how many repetitions are there? If the task takes more than one day, give the repetitions for one day.
1 ☐ no repetitions
2 ☐ 1-2 repetitions
3 ☐ 3-4 repetitions
4 ☐ 5-8 repetitions
5 ☐ 9-15 repetitions
6 ☐ 16-30 repetitions
7 ☐ 31-60 repetitions
8 ☐ 61-100 repetitions
9 ☐ 101-200 repetitions
10 ☐ more than 200

4c. RATE
What rate best describes how often the torque or turn activity is repeated?
1 ☐ not repeated
2 ☐ 1-2 times per minute
3 ☐ 3-4 times per minute
4 ☐ 5-8 times per minute
5 ☐ 9-15 times per minute
6 ☐ 16-30 times per minute
7 ☐ 31-45 times per minute
8 ☐ 46-60 times per minute
9 ☐ 61-75 times per minute
10 ☐ more than 75 times per minute

4d. FORCE
What force must one airman usually apply to do this torque or turn activity?
1 ☐ 0-9 lbs
2 ☐ 10-19 lbs
3 ☐ 20-29 lbs
4 ☐ 30-39 lbs
5 ☐ 40-49 lbs
6 ☐ 50-59 lbs
7 ☐ 60-69 lbs
8 ☐ 70-79 lbs
9 ☐ 80 lbs or more

4e. BODY POSTURE
What is the usual posture one assumes while performing the torque or turn activity?
1 ☐ standing
2 ☐ sitting
3 ☐ lying
4 ☐ kneeling
5 ☐ stooping (bending knees)
6 ☐ bending at waist
7 ☐ walking
8 ☐ swimming

4f. POSITION
As the airman grips the object to be torqued or turned, how far is the point of his/her grip from the floor?
1 ☐ more than 2 ft below the surface
2 ☐ 1-2 ft below the surface
3 ☐ surface level to 1 ft below
4 ☐ surface level to 1 ft above
5 ☐ 1-2 ft above the surface
6 ☐ 3-4 ft above the surface
7 ☐ 5-6 ft above the surface
8 ☐ 7 ft or more above the surface

4g. DISTANCE
What is the length of the radius of the object being turned?
1 ☐ 0-2 in
2 ☐ 3-5 in
3 ☐ 6-8 in
4 ☐ 9-12 in
5 ☐ 13-24 in
6 ☐ 25-36 in
7 ☐ 37-48 in
8 ☐ 49-60 in
9 ☐ more than 60 in

4h. REVOLUTIONS
How many revolutions does it take to complete the torque or turn activity?
1 ☐ 0-1/2 revolution
2 ☐ 1/2-1 revolution
3 ☐ 2-4 revolutions
4 ☐ 5-9 revolutions
5 ☐ 10-24 revolutions
6 ☐ 25-49 revolutions
7 ☐ 50-99 revolutions
8 ☐ 100-199 revolutions
9 ☐ 200 revolutions or more

4i. TIME
How long does it usually take to make the number of revolutions indicated in question 4h?
1 ☐ 1-2 sec
2 ☐ 3-5 sec
3 ☐ 6-10 sec
4 ☐ 11-20 sec
5 ☐ 21-40 sec
6 ☐ 41-60 sec
7 ☐ 1-2 min
8 ☐ 3-5 min
9 ☐ 6 min or more

GENERAL TASK INFORMATION

ANSWER THESE QUESTIONS FOR THIS TASK

5a. TIME
What is the approximate time usually required to complete this entire TASK from start to finish?
1 ☐ 1/2 hr or less
2 ☐ 1 hr
3 ☐ 2 hr
4 ☐ 3 hr
5 ☐ 4 hr
6 ☐ 8 hr (one shift)
7 ☐ 2 shifts
8 ☐ 3 or more shifts

5b. PERCENT PERFORMING
Approximately what percent of the airmen in your AFSC perform this task?
☐☐ %

5c. PERCENT TIME
What percent of the airman's man-year is spent performing this task?
☐☐ %

5d. ENVIRONMENT
What percent of the time is this task performed in each of the following environments? (Fill in all - be sure.)
☐☐☐ % indoors
☐☐☐ % outdoors
☐☐☐ % inflight
100 % TOTAL

5e. MANPOWER
How many airmen usually work together as a team to accomplish this task?
☐☐ airmen

5f. FREQUENCY
How often is this task usually performed? (Write in times per day, per week, OR per month.)
☐☐☐ times per day
☐☐☐ times per week
☐☐☐ times per month

6a. What <u>percentage</u> of the heavy work in your AFSC is covered by the four categories of effort used in this survey, i.e., lift/lower, carry, push/pull, and turn/torque?

[1][0][0] %

6b. If there are other categories of <u>heavy work effort</u> (other than lift/lower, carry, push/pull, and turn/torque) in your AFSC, name them below:

(1) _____ (3) _____

(2) _____ (4) _____

<u>REMARKS</u>. If you have comments or additional information about the tasks you have just evaluated, provide them in the space below.

<u>STOP</u>

After you have completed all three sections of this survey (including write-ins where appropriate), please check to be sure that all tasks have been rated.

Return completed booklet to C3PO for transmittal to:

AFHRL/MPUS
Attn: Kentron International, Inc.
Brooks AFB TX 78235

APPENDIX D

FIELD VALIDATION SCHEDULE

INTERVIEW SCHEDULE

TRIP	DATE BASE & LOCATION	COMMAND	K	AFSC #	AFSC TITLE
	Feb 13-15, 1980	ATC	038	571X0	Fire Protection
1	Reese AFB		034	551X0	Pavements Mtn
	Hurlwood, Tx		023	431X1	Aircraft Mtn (T37/T38)
	Feb 19-20, 1980	AFLC	018	361X0	Outside Wire & Ant Mtn & Rpr
2	Wright-Pat. AFB		035	551X1	Construction Equipment
	Dayton, Ohio				
	Mar 5, 1980	ATC	018	571X0	
3	Reese AFB		035	551X1	Verification Only
	Hurlwood, Tx		023	431X1	
	Mar 7, 1980	ATC	036	552X0	Carpentry Specialist
	Reese AFB		032	545X0	Refrigeration & Air Cond.
4	Hurlwood, Tx				
	Mar 17-21, 1980	AFLC	015	32272	Avionic Sensor System
	Wright-Pat. AFB		016	32873	Electonic Warfare System
	Deyton, Ohio		023	43171	Aircraft Mtn
			032	545X0	Refrigeration & Air Cond.
			027	474X2	Vehicle Mtn
5			034	551X0	Pavements Mtn
			031	542X1	Electricel Power Line
			036	552X0	Carpentry Specialist
			037	552X1	Masonry Specialist
			028	472X3	Vehicle Mtn
		AFSC	011	31670	Msl Elect Equip & Msl Sys
	Apr 2-3, 1980	TAC	023	431X1	Aircraft Mtn (F-111)
	Cannon AFB		028	472X3	Vehicle Mtn
	Clovis, N. M.		025	472X0	Veh Mtn (Base Mtn Rpr)
6			034	551X0	Pevements Mtn
			026	472X1	Vehicle Mtn
			035	55171	Construction Equipment
	May 13-15, 1980	SAC	12/13	316X2F	Missile Electronic Equip Mtn
	Little Rock AFB	"	"	"	" " " "
	Jacksonville, ARK	"	"	"	" " " "
		"	"	"	" " " "
		"	"	"	" " " "
		"	024	443X0	Missile Mechanic, Titan
		"	"	"	" " "
		"	029	445X0	Missile Facilities (F)
7		"	"	"	" " "
		"	017	328X4	Avionic Inert & Radar Nav Sys
		"	036	552X0	Carpentry Specialist
		"	038	571X0	Fire Protection
		MAC	033	547X0	Heeting Systems
		MAC	026	472X1	Vehicle Mtn (Special Purpose)
		MAC	028	47273	Vehicle Mtn
		SAC	XXX	443X1	Missile Pneudraulics Rpr

INTERVIEW SCHEDULE (CONTINUED)

TRIP	DATE BASE & LOCATION	COMMAND	K	AFSC #	AFSC TITLE
	June 16-20, 1980	SAC	014	321X0	Bomb-Navigation System
	Dyess AFB	"	"	"	" " "
	Abilene, TX	MAC	006	114X0	Aircraft Loadmaster (c-130 H)
		SAC	016	328X3	Electronic Warfare System
		"	"	"	" " "
		"	"	"	" " "
		MAC	017	328X4	Avionic Inert & Radar Nav Sys
		"	"	"	" " " " "
		SAC	001A	811X0A	Security Police (Dog Qual)
8		"	"	"	" " "
		"	002A	811X2A	Law Enforcement (Dog Qual)
		AFCC	020	362X4	Telephone Equip Install/Rprmn
		SAC	031	542X1	Electrical Power Line
		"	037	552X1	Masonry Specialist
		"	025	472X0	Vehicle Mtn
		"	027	472X2	Vehicle Mtn
		"	023	431X2A	Aircraft Mtn (B-52D)
		"	"	"	" "
		"	"	431X2E	" " (KC-135)
		"	"	431X2C	" " (C-130H)
		"	"	"	" " "
	Jun 30-Jul 3, 1980	SAC	001	811X0	Security Police
	Carswell AFB		001A	811X0A	" "
	Ft. Worth, Tx		014	321X0	Bomb Navigation System
			"	"	" " "
			017	328X4	Avionic Inert & Radar Nav Sys
			023	431X2	Aircraft Mtn (B-52D)
			"	"	" " (KC-135)
9			031	542X1	Electrical Power Line
			033	547X0	Heating Systems
			038	571X0	Fire Protection
			009	304X4	Ground Radio Equip & Repair
			021	423X2	Aircrew Egress Sytems
			037	552X1	Masonry Specialist
	Jul 14-18, 1980	SAC	011	316X0	Msl Elec Eq (G/H)/Msl Sys Anal (G)
	Ellsworth AFB	"	"	"	" " " " " " "
	Rapid City, SD	"	"	"	" " " " " " "
			024	443X0	Missile Mech (Minuteman)
			"	"	" " "
			"	"	" " "
			034	551X0	Pavements Mtn
			037	552X1	Masonry Specialist
			019	361X4	Msl Sys Cable Splicing & Mtn
10			"	"	" " " " " "
			"	"	" " " " " "
			023	431X2	Aircraft Mtn (KC-135)
			"	"	" " (B-52D)
			030	445X0	Missile Facilities
			"	"	" "

INTERVIEW SCHEDULE (CONTINUED)

TRIP	BASE & LOCATION	COMMAND	K	AFSC #	AFSC TITLE
			021	423X2	Aircrew Egress Systems
			009	304X4	Gnd Radio Equip & Repair
		SAC	036	552X0	Carpentry Specialist
			"	"	"
10			027	472X2	Vehicle Maintenance
Cont			004	112X0	Inflight Refueling Operator
			"	"	"
			041	631X0	Fuel Services Spec/Tech
			"	"	"
	Jul-28-31, 1980	MAC	036	552X0	Security Police
	Scott AFB		02A	811X0	Law Enforcement (Dog Qual)
	Belleville, Ill		"	"	"
			005	113X0	Flight Engineer
			006	114X0	Aircraft Loadmaster
			"	"	"
			"	"	"
			"	"	"
			"	"	"
			"	"	"
			007	115X0	Pararescue/Recovery
			009	304X4	Ground Radio Equip Repair
			018	361X0	Outside Wire & Mtn & Repair
			019	361X1	Cable Mtn Splicing
			020	362X4	Telephone Equip Install/Rprm
			"	"	"
11			023	431X2	Aircraft Mtn (C-9)
			"	"	" (C-140)
			027	472X2	Vehicle Mtn
			032	545X0	Refrigeration & Air Cond.
			033	547X0	Heating Systems
			034	551X0	Pavement Maintenance
			035	551X1	Construction Equipment Oper
			036	552X0	Carpentry Specialist
			037	552X1	Masonry Specialist
			038	571X0	Fire Protection
			041	631X0	Fuel Services Specialist/Tech
			"	"	"
		MAC	043	922X0	Aircrew Life Support Spec
			"	"	"
	Aug 11-15, 1980	TAC	015	322X2	Avionic Sensor System
	Nellis AFB		"	"	"
	Las Vegas, Nev		021	423X2	Aircraft Egress System
			"	"	"
12			022	431X0	Helicoptor Mtn
			023	431X1	Aircraft Mtn
			"	"	"
			"	"	"
			"	"	"
			026	472X1	Vehicle Mtn

INTERVIEW SCHEDULE (CONTINUED)

TRIP	BASE & LOCATION	COMMAND	K	AFSC #	AFSC TITLE
			028	472X?	Vehicle Mtn
			030	547X0	Heating Systems
			"	"	" "
			039	611X0	Supply Services
			"	"	" "
12			041	631X0	Fuel Services Spec/Tech
Cont			042	921X0	Survival Specialist
			"	"	" "
			043	922X0	" "
			"	"	" "
			022	431X0	Helicopter Mtn
	Aug 18-22, 1980	SAC	008	262X0	Air Traffic Control
	Vandenberg AFB	"	010	316X0	Missile System Analyst
	Lampoc, CA	"	011	316X0	Missile Elect Equip
		"	"	"	" " "
		"	"	"	" " "
		"	013	316X2F	Msl Elect Equip Mtn
		"	018	361X0	Outside Wire & Ant Mtn & Repair
		"	019	361X1	Cable Splicing & Mtn
		"	020	362X4	Telephone Equip Install/Rprm
		"	"	"	" " " "
		MAC	022	431X0	Helicoptor Mtn
		SAC	024	443X0	Missile Mechanic
		"	"	"	" "
13			"	"	" "
			025	472X0	Vehicle Mtn
			"	"	" "
			030	445X0G	Missile Facilities (Minuteman)
			"	"	" " "
			039	611X0	Supply Services
			"	"	" "
			"	"	" "
			"	"	" "
			043	922X0	Aircrew Life Support Specialist
			XXX	443X1	Missile Pneudraulics (Titan)
			ZZZ	445X1	Msl Liquid Propellant Systems
			"	"	" " " "
			"	"	" " " "
	Jan 5-9, 1981	SAC	002	811X2	Law Enforcement
	Fairchild AFB	"	"	"	" "
	Spokane, WA	"	003	111X0	Aerial Gunner
		"	"	"	" "
		"	004	112X0	Inflight Refueling
14		"	"	"	" "
		MAC	005	113X0	Helicopter Flight Engineer
		"	"	"	" "
		"	007	115X0	Pararescue/Recovery
		"	"	"	" "

INTERVIEW SCHEDULE (CONTINUED)

TRIP	BASE & LOCATION	COMMAND	K	AFSC #	AFSC TITLE
		APS	A101	999604	Postal Specialist
		SAC	41	432X3	Fuel System Specialist
		"	A 02	321X1	Defensive Fire Control
		"	"	"	" " "
		"	-	511X0	Data Processing
14		ATC	042	921X0	Survival
cont		"	"	"	"
		"	"	"	"
		"	"	"	"
		"	"	"	"
		"	"	"	"
		SAC	022	431X0	Helicopter Maintenance
		"	"	"	" " "
	Jan 12-15, 1981	SAC	002	811X2	Law Enforcement
	Carswell AFB	"	"	"	" "
	Fort Worth, TX	"	"	"	" "
		"	"	"	" "
		SAC	003	111X0	Aerial Gunner
		"	"	"	" "
		"	"	"	" "
		SAC	004	112X0	Refueling
15		"	"	"	"
		MAC	005	113X0	Flight Engineer (C-130)
		AFCC	008	272X0	Air Traffic Control
		TAC	012	316X1L	Missile Sys Mtn (Air/Air Msl)
		SAC	023	431X2C	Aircraft Mtn (C-130)
		"	040	612X0	Meatcutter
		"	A02	321X1G	Defensive Fire CH Sys (B-52D)
		"	"	"	" " " " "
	Feb 11-13, 1981	ATC	031	542X1	Electrical Power Line
16	Shepherd AFB	"	"	"	" " "
	Wichita Falls, TX	"	"	"	" " "
	Feb 16-20, 1981	TAC	005	113X0B	Flt Engineer (Helicopter)
	Nellis AFB	"	"	"	" " "
	Las Vegas, NV	"	016	328X3	Electronic Warfare Systems
17		"	032	545X0	Refrigeration & Air Conditioning
		"	012	316X1L	Missle System Maintenance
		"	"	"	" " "
	March 1-4, 1981	AFSC	005	113X0	Flt Engineer (Helicopter)
	Kirtland, AFB	"	"	"	" " "
	Albuquerque, NM	"	"	"	" " "
		"	006	114X0	Loadmaster (C-130)
		"	"	"	" "
		"	007	115X0	Pararescue
18		"	020	362X4	Tel. Equip. Inst. & Repair
		"	022	431X0	Helicopter Maint. (H-53)
		"	"	"	" " (H-3)
		"	"	"	" " (H-1)
		"	034	551X0	Pavement Maint.

INTERVIEW SCHEDULE (CONTINUED)

TRIP	BASE & LOCATION	COMMAND	K	AFSC #	AFSC TITLE
		AFSC	037	552X1	Masonry Specialist
18		"	040	612X0	Meatcutter
Cont		"	"	"	"
		"	043	922X0	Aircrew Lift Support
	March 16-20, 1981	MAC	005	11370C	Flight Engineer (C-5)
	Travis AFB	"	"	"	" " (C-141)
	Fairfield, CA	"	006	11470	Aircraft Loadmaster (C-5)
		"	"	11490	" " (C-141)
		"	"	11400	" " "
19		"	"	11470	" " (C-5)
		"	"	"	" " "
		"	023-2	43172B	Aircraft Maintenance (C-5)
		"	A-94	99505	Courier
		"	"	"	"
		"	"	"	"
		"	040	61270	Meatcutter
		"	"	"	"
	April 27-May 1, 1981	SAC	010	316X0F	Missile System Anal (LGM-25)
		"	"	"	" " " "
	Davis Monthan AFB	"	012-L	316X1F	Msl Sys Mtn (AIM Msl/Agm 45/
		"	"	"	" " "
		"	013-F	316X2F	Msl Elect Equip (LGM-25)
		"	015	322X2B	Avionic Sensor Sys (Elec Opt Sys)
		"	XXX	443X1	Missile Pneudraulic Repair
		"	23-1X	431X1C	Tac A/C Mtn (A-10)
		"	020	362X4	Telephone Install & Repair
20		"	021	423X2	Aircraft Egress Sys (A-10)
		"	023-1X	431X1C	Tac A/C Mtn (A-10)
		"	"	"	" " " "
		"	023-2X	431X2	Alft/Bomb A/C Mtn (C-130)
		"	024	443X0E	Missile Mtn (LGM-25)
		"	029	445X0F	Msl Facilities (LGM-25, Mtn)
		"	"	"	" " " "
		"	067	362X3	Missle Communications Sys
		"	"	"	" " "
		"	"	"	" " "
		"	ZZZ	445X1	Missile Liquid Propellant Sys
		"	"	"	" " "
	May 18-22, 1981	MAC	007	115X0	Pararescue/Recovery
	Elgin AFB	AFSC	A012	222X0	Geodetic
	Valpariso, FL	"	008	272X0	Air Traffic Control
		"	015	322X2B	Avionic Sensor Systems
					Tac/Real Time Display Elect. Sen.
21		"	"	"	Avionic Sensor Systems
					Tac/Real Time Display Elect. Sen.
		AFCC	019	361X1	Cable Splicing Instal. & Repair
		"	020	362X4	Telephone Equip. Instal. & Repair
		MAC	022	431XDC	Helicopter Maintenance
		"	"	"	Articulated Rotor

INTERVIEW SCHEDULE (CONTINUED)

TRIP	BASE & LOCATION	COMMAND	K	AFSC #	AFSC TITLE
		AFSC	022	431X0D	Helicopter Maintenance Semi Rigid Rotor
		MAC	023-2X	431X2C	Airlift/bomb Aircraft Mainte. C-130
21		AFSC	025	472X0	Base Vehicle Equip. Mainte.
Cont		"	026	472X1	Special Vehicle Maintenance
		"	027	472X2	Gen. Purpose Vehicle Mainte.
		"	028	472X3	Vehicle Body Maintenance
		"	042	921X0	Survival Training
	June 1-5, 1981	MAC	05	113X0C	Flight Engineer(Perf.Qual.C-141)
	McGuire AFB, NJ	"	"	"	" " " "
	Wrightstown, NJ	"	17	328X4	Avion. Inert. & Radar Nav. Sys.
		"	23-2X	431X2	Alft/Bomb Acft. Mtn. (C-141)
		"	32	545X0	Refrigeration & Cryogenics
		"	35	551X1	Construction Equipment
		"	41	631X0	Fuel
		"	43	922X0	Aircraft Lift Support
		"	58	328X0	Avionic Communications
		"	"	"	" "
		"	63	341X4	Digital Flight Simulator
22		"	"	"	" " "
		"	69	392X0	Maintenance Management
		"	"	"	" "
		"	73	423X3	Aircraft Fuel Systems
		"	"	"	" " "
		"	74	423X4	Aircraft Pneudraulic Systems
		"	"	"	" " "
		"	76	426X1	Corrosion Control
		"	119	324X0	Precision Measuring Equipment
		"	"	"	" " "
		"	126	432X5	Aerospace Ground Equipment
		"	05	113X0C	Flt Engineer(Perf. Qual. C-141)
	June 8-12, 1982	TAC	05	113X0B	Flt Engineer (Helicopter)
	Hill AFB, UT	"	07	115X0	Pararescue/Recovery
	Ogden, UT	"	12P	316X1P	Missile Sys. Mtn. (RPV/Drone)
		"	"	"	" " " "
		"	23-1X	431X1F	Tactical Aircraft Mtn (F-16)
		"	24P	443X0P	Missile Mtn (Drone/RPV)
		"	"	"	" " "
23		"	A24C	325X4C	Int. Avionics Comp. Test. Stn.
		"	"	"	" " " "
		AFSC	59	328X1	Avionics Navigation Sys.
		TAC	74	423X4	Aircraft Pneudralic Sys.
		"	79	461X0	Munitions System
		"	82	464X0	Explosive Ord. Disposal
		"	"	"	" " "

INTERVIEW SCHEDULE (CONTINUED)

TRIP	BASE & LOCATION	COMMAND	K	AFSC #	AFSC TITLE
		TAC	167	325X6C	Int. Avionics Attack Con. Sys.
23		"	"	"	" " " " "
Cont		"	"	"	" " " " "
		"	168	326X7C	Int. Avio. Instm & FH Con. Sys.
		"	"	"	" " " " " "
		"	169	326X8C	Int. Avio. Instm Nav & Pen Aids
		"	"	"	" " " " " "
	June 22-26, 1981	TAC	02	811X2	Law Enforcement
	Bergstrom AFB	"	15A	322X2A	Avionic Sensor Systems
	Austin, TX	"	15C	322X2C	" " "
		"	57	325X1	Avionic Instrument System
		"	"	"	" " "
		"	65	341X5	Digital NAV/TAC Training Device
		"	69	392X0	Maintenance Management
		"	70	404X0	Prec. Imagery & Audiovis Medic
		"	"	"	" " " "
		"	72	423X0	Aircraft Electrical Repair
24		"	74	423X4	Aircraft Pneudraulic System
		"	78	427X5	Airframe Repair
		"	"	"	" "
		"	80	462X0	Aircraft Armament Systems
		"	121	326X0C	Avionics Aeroground Equip (RF-4)
		"	126	423X5	Aerospace Ground Equipment
		"	157	275X0	Tactical Air Command & Control
		"	"	"	" " " "
	June 22-26, 1981	DMA	A12	222X0	Geodetic
	F.E. Warren AFB	"	"	"	"
	Cheyenne, WY	AFCC	55	291X0	Telecommunications Operstions
		"	"	"	" " "
		SAC	11	316X0G	Missile Systems Analyst (MM-3)
		"	"	"	" " "
		"	13	316X2G	Missile Elect. Equip. (MM-3)
		"	119	324X0	Prec. Measuring Equipment
		"	"	"	" " "
		MAC	58	328X0	Avionic Communications
		SAC	66	341X7	Missile Trainer
25		"	"	"	" "
		"	67	362X3	Missile Control Communica. Sys.
		"	24	443X0G	Missile Mtn (MM-3)
		"	30	445X0G	Missile Facilities (MM-3)
		"	81	463X0	Nuclear Weapons
		"	136	602X1	Freight Traffic
		"	41	631X0	Fuel
		"	87	645X1	Material Facilities
		"	93	903X0	Radiology
		"	498	99601	Missile Mtn Superintendent
		"	4100	99603	Minuteman NCO Code Controller

INTERVIEW SCHEDULE (CONTINUED)

TRIP	BASE & LOCATION	COMMAND	K	AFSC #	AFSC TITLE
	June 29-July 3, 1981	SAC	03	111X0	Defensive Aerial Gunner
	"	"	04	112X0	Inflight Refueling Operator
	Ellsworth AFB	AFCC	55	291X0	Telecommunications Operations
	Rapid City, SD	SAC	11	316X0G	Missile Sys. Analyst (MM-2)
		"	"	"	" " " "
		"	163	316X0T	Missile Sys. Analyst (SRAM)
		"	"	"	" " " "
		"	13	316X2G	Missile Elect. Equip. (MM-2)
		"	"	"	" " " "
		"	61	341X2	Defensive Systems Trainer
		"	66	341X7	Missile Procedures Trainer (LCF)
26		"	"	"	Missile Proc. Trainer (Airbrone)
		"	"	"	" " " "
		"	23-2X	431X2E	Aircraft Mtn (Crew Chief)
		"	"	"	" " " "
		"	"	"	" " " "
		"	24	443X0G	Missile Mtn (MM-2)
		"	80	462X0	Aircraft Armament Systems
		"	81	463X0	Nuclear Weapons
		"	87	645X1	Material Facilities
		"	A100	99603	Minuteman NCO Code Controller
	July 12-17, 1981	AFCC	08	27299	Air Traffic Control
	Altus AFB	MAC	057	32571	Avionics Instrumentation Sys.
	Altus, OK	"	058	32870	Avionics Communications
		"	059	32871	Avionics Navigation Sys.
		"	063	34174	Digital Flight Simulator
		"	065	34176	Digital NAV/TAC Training Device
		"	070	40450	Precision Photo Systems Repair
		"	072	42370	Aircraft Electrical Sys.
		"	078	42775	Airframe Repair
27		"	083	55254	Protective Coating
		"	102	25170	Weather
		AFCC	105	30371	Air Traffic Control Radar
		"	"	30351	" " " "
		MAC	119	32470	Precision Measuring Equip.
		"	120	32570	Automatic Flight Control Sys.
		"	"	"	" " " "
		"	121	32670D	Avionics Aeroground Equipment
		"	"	"	" " " "
		"	132	55265	Plumbing
		"	"	"	"
		"	160	30270	Weather Equipment

INTERVIEW SCHEDULE (CONTINUED)

TRIP	BASE & LOCATION	COMMAND	K	AFSC #	AFSC TITLE
	July 13-17, 1981	MAC	101	242X0	Disaster Preparedness
	Scott AFB	"	102	251X0	Weather
	Belleville, IL	AFCC	103	293X3	Ground Radio Operator
		"	160	302X0	Weather Equipment
		"	105	303X1	Air Traffic Control Radar
		"	109	304X1	Navigation Aids Equipment
		"	112	306X0	Electronic Comm & Crypto Systems
		"	"	"	" " " "
		MAC	162	306X1	Elect. Mech. Comm. & Crypto Sys.
		"	"	"	" " " " "
		"	113	306X2	Telecomm. Sys./Equip. Mtn
		"	"	"	" " " "
		"	114	307X0	Telecomm. Sys. Control
		"	"	"	" " "
		"	119	324X0	Prec. Measuring Equipment
		"	120	325X0	Auto Flight Control Systems
		"	58	328X0	Avionic Communications
		"	65	341X6	Digital Nav/Tactics Training Dev.
28		"	69	392X0	Maintenance Management
		"	"	"	" "
		"	72	423X0	Aircraft Electrical Systems
		"	"	"	" " "
		"	126	423X5	Aerospace Ground Equipment
		"	171	426X2	Jet Engines
		"	"	"	" "
		"	78	427X5	Airframe Repair
		"	"	"	" "
		"	23-2X	431X2	Airlift/Bombardment Aircraft
		"	"	"	" " "
		"	32	545X0	Refrigerator & Cryogenics
		"	132	552X5	Plumbing
		"	136	602X1	Freight Traffic
		"	87	645X1	Material Facilities
		"	A70	A902X0	Airborne Medical Service
		"	"	"	" " "
	July 20-Aug 24, 1981	TAC	15-C	322X2C	Avion. Sensor Sys (Electro-Opti. System)
	Nellis AFB	"	23-1X	431-1F	Tactical Aircraft Mtn (F-15
	Las Vegas, NV	"	A-23	326X3B	Int. Avi. EW Equip. & Comp (F-16)
		"	"	"	" " " " "
		"	A-24	326X4C	Int. Avi. Comp. Test Stat. (F-16)
		"	"	"	" " " " " (F-15)
29		"	A-25	326X5B	Int. Avi. Man. Test Stat. & Comp (F-15)
		"	59	328X1	Avionics Navigation System
		"	69	392X0	Maintenance Management
		"	73	423X3	Aircraft Fuel Systems
		"	74	423X4	Aircraft Pneudraulic Systems

INTERVIEW SCHEDULE (CONTINUED)

TRIP	BASE & LOCATION	COMMAND	K	AFSC #	AFSC TITLE
		TAC	79	461X0	Munitions System
		"	"	"	" "
		"	80	462X0E	Aircraft Armament Sys (F-15)
		"	"	462X0F	Aircraft Armament Sys (F-16)
		"	"	462X0E	" " " (F-15)
		"	"	462X0D	" " " (F-4)
		"	"	462X0C	" " " (A-10)
		"	"	"	" " " "
		"	"	463X0	Nuclear Weapons
		"	118	321X2P/Q	Weapon Control Systems
		"	119	324X0	Precision Measuring Equipment
		"	120	325X0	Auto Flight Control Systems
29		"	"	"	" " " "
		"	121-D	326X0	Avionics Aero Ground Equip (A-7)
		"	121-C	326X0	Avionics Aero Gr. Equip(F/RF-4)
		"	167	326X6	Int. Avionics Attack Control Sys
		"	168	326X7C	Int. Avionics Instm. & Flt Cont. Sys (F-16)
		"	"	326X7B	Int. Avionics Instm. & Flt Cont. Sys (F-15)
		"	"	326X7C	Int. Avionics Instm. & Flt Cont. Sys (F-16)
		"	"	326X7C	Int. Avionics Instm. & Flt Cont. Sys (F-16)
		"	169	326X8	Int. Avionics Comm, Nav, & Pen Air System
	July 27-Aug 31, 1981	MAC	7	115X0	Pararescue/Recovery
	Elmendorf AFB	ESC	A3	202X0	Radio Comm. Anal/Security
	Anchorage, AL	"	"	"	" " " "
		AAC	101	242X0	Disaster Preparedness
		MAC	102	251X0	Weather
		AFCC	8	272X0	Air Traffic Control
		MAC	80	272X0D	Air Traffic Control -Combat Control Team Ops.
		AFCC	160	302X0	Weather Equipment
30		"	109	303X1	Air Traffic Control Radar
		"	105	304X1	Navigation Aids Equipment
		"	112	306X0	Elect. Comm. & Crypto. Equip. Sys
		"	162	306X1	Elec. Mech. Comm. & Crypto Equip. Sys.
		"	113	306X2	Telecomm. Sys/Equip. Maint.
		"	121	326X0C	Avionics Aerosp. Ground Equip. -F/RF-4 Peculiar AGE
		"	18	361X0	Cable & Antenna Sys Instl/ Maintenance

INTERVIEW SCHEDULE (CONTINUED)

TRIP	BASE & LOCATION	COMMAND	K	AFSC #	AFSC TITLE
		AAC	72	423X0	Acft Electrical Sys
		"	23-1X	431X1C	Tac Acft Maintenance -F/RF-4
		MAC	23-2X	431X2C	Alft/Bombardment Acft Mainte -C-130
		AAC	80	462X0	Aircraft Armament Sys
30		"	31	452X1	Electrical Power Line
		"	132	552X5	Plumbing
		MAC	139	605X1	Air Cargo
		"	A101	99604	Postal Specialist
			A101	99604	Postal Specialist
	Aug 3-7, 1981	MAC	102	251X0	Weather
	Eielson AFB	AAC	157	275X0	Tactical Air Comd & Con
	Fairbanks, AL	AFCC	160	302X0	Weather Equipment
		"	105	303X1	Air Traffic Control Radar
		AAC	107	303X3	Auto Tracking Radar
		AFCC	109	304X1	Navigation Aids Equip
		"	111	304X6	Space Comm Sys Equip Opr
		"	"	"	" " " " "
		"	112	306X0	Elect Comm & Crypto Equip Sys
		"	162	306X1	Elect Mech Comm & Crypto Equip Sy
		AAC	75	426X1	Reciprocating Propulsion
		"	171	426X2	Jet Engine
		SAC	"	"	" "
31		"	23-2X	431X2E	Alft/Bombardment Acft Maint -C/KC-135,VC-137,KC-10,E-3,E-4
		"	"	"	Alft/Bombardment Acft Maint -C/KC-135,VC-137,KC-10,E-3,E-4
		AAC	79	461X0	Munitions Sys
		"	80	462X0D	Aircraft Armament Sys (F-4)
		"	129	542X2	Elec Power Production
		"	132	552X5	Plumbling
		"	136	602X1	Freight Traffic
		"	87	645X1	Material Facilities
		ATC	42	921X0	Survival Training
		AAC	A101	99604	Postal Specialist
	Aug 10-14, 1981	TAC	A-23	32653A	Integ Avionics EW Equip & Comp.
	Cannon AFB	"	"	"	" " " " " "
	Clovis, NM	"	A-24	32654A	Integ Avionics Compute Test Sta
		"	"	"	" " " " " "
		"	A-25	32655A	Integ Avionics Man Tst Sta & Comp
32		"	"	"	" " " " " "
		"	A-29	54270	Electrical
		"	23-1X	43151J	Tactical Aircraft Maintenance
		"	63	34154	Digital Flight Simulator
		"	"	"	" " "

INTERVIEW SCHEDULE (CONTINUED)

TRIP	BASE & LOCATION	COMMAND	K	AFSC #	AFSC TITLE
		TAC	65	34176	Digital Nav/Tac Training Device
		"	"	"	" " " " "
		"	72	42350	Aircraft Electrical Systems
		"	73	42373	Aircraft Fuel Systems
		"	76	42771	Corrosion Control
		"	79	46270	Munition Systems
		"	80	4 70H	Aircraft Armament Systems
		"	83	55254	Protective Coatings
		"	82	46450	Explosive Ordinance Disposal
		"	87	64571	Material Facilities
		"	93	90370	Radiologic
		"	101	24270	Disaster Preparedness
		"	"	24250	" "
		"	109	30471	Navigational Aids Equipment
		"	112	30650	Elect Comm & Crypto Equip Sys
		"	113	30672	Telecomm Sys/Equip Mtn
		"	72	42370	Aircraft Electrical Sys
		"	125	42371	Aircraft Environmental Sys
32		"	126	42375	Aerospace Ground Equipment
		"	129	54252	Electrical Power Production
		"	137	60370	Vehicle Opr/Dispatcher
		AFCC	160	30270	Weather Equipment
		TAC	162	30671	Elect Mech Comm & Crypto Equip
		"	167	32676A	Integ Avionics Attack Con Sys
		"	"	"	" " " " "
		"	168	32657A	Inte Avionics Instm & Flt Con Sys
		"	"	32677A	" " " " "
		"	"	"	" " " " "
		"	169	32678A	Inte Avi Comm Nav & Pen Aids Sys
		"	"	"	" " " " " " "
		"	171	42672	Jet Engine
		"	"	"	" "
		"	"	"	" "
		"	181	90870	Veterinery
		"	A103	42773	Fabrication & Parachute
	Aug 17-21, 1981	TAC	101	242X0	Disaster Preparedness
	England AFB	MAC	102	251X0	Weather
	Alexandria, LO	"	"	"	"
		TAC	157	275X0	Tactical Air Comd & Con
		"	"	"	" " " "
		AFCC	160	302X0	Weather Equipment
33		"	109	304X1	Navigation Aids Equip
		"	112	306X0	Elect Comm & Crypto Equip Sys
		TAC	57	325X1	Avionics Instm Sys
		TAC	121D	326X0D	Avionics Aerosp Ground Equip -A-7D/C-5 Avionics Age
		"	59	328X1	Avionic Navigation Sys

INTERVIEW SCHEDULE (CONTINUED)

TRIP	BASE & LOCATION	COMMAND	K	AFSC #	AFSC TITLE
		TAC	63	341X4	Digital Flt Simulator
		"	65	341X6	Digital Nav/Tac Tng Dvs
		"	69	392X0	Maintenance Mgt
		"	A103	427X3	Fabrication & Parachute
		"	77	427X4	Metals Processing
		"	"	"	" "
33		"	78	427X5	Airframe Repair
		"	80	462X0C	Aircraft Armament Sys (A-10)
		"	82	462X0	Explosive Ord Disposal
		"	175	552X2	Metal Fabricating
		"	83	552X4	Protective Coating
		"	93	903X0	Radiologic
		"	"	"	"
		"	180	907X0	Environmental Health
		"	181	908X0	Veterinary
	Aug 24-28, 1981	AFCC	A20	297X0	Radio Frequency Management
	Wright-Patterson	AFLC	A13	231X0	Audio Visual Media
	Dayton, OH	"	A59	371X0P	Band
		"	A59	871X0L	Band
		"	85	622X1	Diet Therapy (X-3)
		"	93	903X0	Radiologic
		"	94	911X0	Aerospace Physiology
		"	"	"	" "
		AFCC	112	306X0	Elect Comm & Crypto Equip Sys
		"	114	307X0	Telecom System Control
		"	"	"	" "
		AFLC	124	918X0	Aerospace Physiology
		"	125	423X1	Aircraft Environmental Sys
		"	133	553X0	Engineering Asst
34		"	"	"	" "
		"	134	566X0	Entomology
		"	136/177	602X0	Passenger & HHG
		"	139	605X1	Air Cargo
		"	143	902X0(C)	Medical Service
		"	"	902X0(A)	" "
		"	160	302X0	Weather Equipment
		"	"	"	" "
		"	"	"	" "
		AFSC	140	511X0	Computer Operations (X-3)
		AFLC	176	566X1	Environmental Support
		"	177	602X0	Passenger & HHG (X-3)
		"	"	"	" " "
		"	178	904X0	Medical Lab
		"	"	"	" "
		"	179	905X0	Pharmacy
		"	180	907X0	Environmental Health
		"	"	"	" "

INTERVIEW SCHEDULE (CONTINUED)

TRIP	BASE & LOCATION	COMMAND	K	AFSC #	AFSC TITLE
		AFLC	181	908X0	Veterinary
		"	182	912X5	Optometry
		"	"	"	"
34		"	184	913X0	Physical Therapy
		"	"	"	"
		"	186	914X1	Mental Health Unit
		"	"	"	"
	Aug 31-Sept 4, 1981	SAC	14	321X0	Bomb-Nav Systems
		"	A02	321X1	Def Fire Control Sys
	Dyess AFB	"	61	341X2	Defensive Sys Trainer
	Abilene, TX	"	64	341X5	Analog Nav/Tac Trng Dvs
		"	"	"	" " " "
		"	70	404X0	Precision Imag & Audio Media Mtn
		"	125	423X1	Acft Environmental Sys
		"	"	"	" " "
		"	73	423X3	Acft Fuel Sys
35		MAC	A102	426X3	Turboprop Propulsion
		"	"	"	" "
		SAC	A103	427X3	Fabrication & Parachute
		MAC	23-2X	431X2	Alft/Bombard Acft Mtnc (C-130)
		SAC	80	462X0	Aircraft Armament Sys (B-52D)
		"	"	"	" " " "
		"	81	463X0	Nuclear Weapons
		"	82	464X0	Explosive Ordinance Disposal
		"	129	542X2	Elect Power Production
	Sept 14-18, 1981	AFCC	55	291X0	Telecommunications Ops
	Tinker AFB	"	"	"	" " "
	Oklahoma City, OK	AFLC	103	293X3	Ground Radio Opr
		TAC	159	294X0	Abn Comm Sys
		"	"	"	" " "
		"	"	"	" " "
		AFCC	A19	295X0	Auto Digital Switching
		"	"	"	" " "
		"	109	304X1	Navigation Aids Equip
		"	111	304X6	Space Comm Sys Equip
		"	"	"	" " " "
36		TAC	123	305X4	Elec Comp & Swg Sys
		"	"	"	" " " "
		AFLC	113	306X2	Telecomm Sys/Equip Maint
		"	"	"	" " " "
		"	114	307X0	Telecomm Sys Control
		MAC	57	325X1	Avionics Instrm Sys
		TAC	A26	328X2	Abn Warning & Con Radar
		"	65	341X6	Digital Nav/Tac Tng Dvs
		AFLC	171	426X2	Jet Engine
		"	A103	427X3	Fabrication & Parachute
		"	"	"	" "

INTERVIEW SCHEDULE (CONTINUED)

TRIP	BASE & LOCATION	COMMAND	K	AFSC #	AFSC TITLE
36		TAC	77	427X4	Metals Processing
		"	"	"	"
		AFLC	83	552X4	Protective Coating
		"	180	907X0	Environmental Health
37	Sept 28-30, 1981 Oct 6-7, 1981 Reese AFB Hurlburt, TX	ATC	55	291X0	Telecommunications Ops
		AFCC	104	296X0	Comm Elect Program Mgt
		"	113	306X2	Telecomm Sys/Equip Mtn
		ATC	57	325X1	Avionics Instm Sys
		"	126	423X5	Aerospace Ground Equipment
		"	76	427X1	Corrosion Control
		"	A29	542X0	Electrical
		"	129	542X2	Elec Power Production
		"	"	"	" " "
		"	175	532X2	Metal Fabricatin
		"	133	553X0	Engineering Assc
		"	134	566X0	Entomology
		"	176	566X1	Environmental Support
		"	136	602X1	Freight Traffic
		"	A106	602X2	Packaging
		"	143	902X0	Medical Service
		"	"	"	" " (Allergy & Immun)
		"	178	904X0	Medical Laboratory
		"	179	905X0	Pharmacy
		"	180	907X0	Environmental Health
		"	181	908X0	Veterinary
		"	94	911X0	Aerospace Physiology
		"	184	913X0	Physical Therapy
		"	187	915X0	Medical Material
		"	124	918X0	Biomedical Equip Maint
38	Nov 2-6, 1981 Kelly AFB San Antonio, TX	AFCC	103	293X3	Ground Radio Operator
		"	A19	295X0	Automatic Digital Switching
		"	"	"	" " "
		"	104	296X0	Comm Elect Program Mgt
		"	08	272X0	Air Traffic Control
		ESC	A20	297X0	Radio Frequency Management
		AFCC	105	303X1	Air Traffic Control Radar
		"	108	304X0	Wideband Comm Equip
		"	"	"	" " "
		"	110	304X5	Television Equipment
		"	"	"	" "
		"	123	305X4	Elect Comp & Swg System
		"	113	306X2	Telecom Sys/Equip Mtn
		"	19	361X1	Cable Splicing Install & Mtn
		AFCSC	83	552X4	Protective Coatings
		ESC	136	602X1	Freight Traffic
		AFLC	A106	602X2	Passenger & HHG

INTERVIEW SCHEDULE (CONTINUED)

TRIP	BASE & LOCATION	COMMAND	K	AFSC #	AFSC TITLE
		ESC	137	603X0	Vehicle Opr/Dispatching
		AFCC	"	"	" " "
		AFLC	138	605X0	Air Passenger
		"	139	605X1	Air Cargo
		AFCOMS	A48	733X1	Manpower Mgt
		ESC	"	"	" "
38		AFCOMS	140	791X0	Public Affairs
		HQUSAF	141	791X1	Radio & TV Broadcasting
		AFLC	143	902X0	Medical Service
		AFLC	180	907X0	Environmental Health
		"	187	915X0	Medical Material
		"	178	924X0	Medical Laboratory
	Nov 16-20, 1981	AFCC	08	27270	Air Traffic Control
	Tinker AFB	"	103	29373	Ground Radio Opr
	Oklahoma City, OK	"	105	30371	Air Traffic Control Radar
		"	"	D30371	" " " "
		"	"	"	" " " "
		"	108	30470	Wideband Comm Equip
		"	09	K130454	Ground Radio Comm
		"	123/262	W30574	Elect comm & Slig Sys
		"	59	32899	Avionic Navigation Sys
		TAC	A26	A32872	Abn Warning & Con Radar
		"	"	32872	" " " "
		"	"	"	" " " "
		SAC	170	32875	Abn Comd Post Comm Equip
		AFLC	"	32899	" " " " "
		AFCC	19	36171	Cable Splicing Instal & Maint
		"	122	36271	Tel Central Off Switching Equip
39		"	"	"	" " " " "
		AFLC	171	42672	Abt Engine
		AFCC	27	47272	Gen Purpoae Veh Maint
		"	"	"	" " " "
		AFLC	A29	54270	Electrical
		"	"	"	"
		AFLC	129	54272	Elec Power Production
		AFLC	33	54572	Heating Sys
		"	34	55170	Pavements Maint
		"	175	55252	Metal Fabricating
		"	"	"	" "
		TAC	138	A60570A	Air Passenger
		AFLC	01	81170	Security
		"	02	81172	Law Enforcement
		"	187	91570	Medical Material
	Jan 4-8, 1982	PACAF	159	A294X0	Airborn Comm Sys (Aircrew)
	Hickam AFB	"	"	"	" " " "
40	Honolulu, HI	AFSC	"	"	" " " "
		PACAF	A19	295X0	Auto Digital Switching
		"	104	296X0	Comm Programs/Rqmts & Res Mgt

INTERVIEW SCHEDULE (CONTINUED)

TRIP	BASE & LOCATION	COMMAND	K	AFSC #	AFSC TITLE
		PACAF	104	296X0	Comm Prog/Rqmts & Resources Mgt
		"	A-20	297X0	Radio Frequency Mgt
		"	"	M297X0	" " " (Aircrew Std/E Examiner)
		"	108	304X0	Wideband Comm Equip
		AFCC	"	W304X0	" " " (Auto Funct Applic Analyst)
		"	109	304X1	Navigation Aids Equip
		PACAF	162	306X1	Elect-Mech Comm & Crypto Equip Sy
		AFSC	A-111	A316X3	Instrumentaion
		"	"	"	"
		"	"	"	"
		PACAF	120	325X0	Auto FH Con Sys
		"	170	328X5	Abn Command Post Comm Equip
40		AFCC	18	361X0	Cable & Antenna Install Mtn
		PACAF	70	404X0	Prec Imagery & Audio Media
		"	72	423X0	Aircraft Electrical Sys
		MAC	"	"	" " "
		PACAF	125	423X1	Aircraft Environmental Sys
		MAC	74	423X4	Aircraft Pneudraulic Sys
		"	"	"	" " "
		PACAF	A102	426X3	Turboprop Propulsion
		"	76	727X1	Corrosion Control
		AFSC	A110	A431X2	Aerial Recovery Technician
		"	"	"	" " "
		"	"	"	" " "
		PACAF	139	605X1	Air Cargo
		"	179	905X0	Pharmacy
		"	184	913X0	Physical Therapy
		"	124	918X0	Biomed Equipment Mtn
	Feb 1-5, 1982 MacDill AFB Tampa, FL	TAC	106	30372	AC & W Radar
		"	"	"	" " "
		"	"	"	" " "
		AFCC	123	30574	Elect Comp & Switching Sys
		TAC	115	30850	Space Sys Equipment
		"	118	32172P	Weapon Control Systems
		"	"	"	" " "
		"	62	34173	Analog Flight Simulator
		"	64	34175	Analog Nav/Tac Tng Dvs
		"	65	34176	Digital Nav/Tac Tng Dvs
41		"	71	40431	Aerospace Photographic Sys
		"	"	"	" " "
		"	"	"	" " "
		"	77	42774	Metals Processing
		"	A104	54571	Liquid Fuel Systems Mtn
		"	"	"	" " " "
		"	A31	56650	Entomology

INTERVIEW SCHEDULE (CONTINUED)

TRIP	BASE & LOCATION	COMMAND	K	AFSC #	AFSC TITLE
		TAC	176	56671	Environmental Support
		"	A106	60272	Packaging
		"	137	60390	Vehicle Opr/Dispatching
		"	138	60550	Air Passenger
		"	140	79170	Public Affairs
		"	143	90270	Medical Service
41		"	"	"	" "
		"	"	"	" " (Aeromedical)
		"	144	90252	Surgical Service
		"	"	"	" "
		"	"	"	" " (Opthalmology)
		"	94	91170	Aerospace Physiology
		"	187	91590	Medical Material
	March 8-12, 1982	AFSC	100	231X0	Audiovisual Media
	Eglin AFB	"	A14	231X2	Audiovis Prod Documentation
	Fort Walton Beach, FL	TAC	106	303X2	AC & W Radar
		"	"	"	" " "
		"	107	303X3	Automatic Tracking Radar
		AFCC	110	304X5	Television Equipment
		"	"	"	" "
		AFSC	118	321X2	Weapon Control Systems
		"	"	321X2P	" " "
		"	"	321X2Q	" " "
		TAC	70	404X0	Precision Photo Systems
		AFSC	71	404X2	Aerospace Photo Systems
		TAC	24	443X0P	Missile Main (Drone/RVP)
		AFSC	174	472X4	Vehicle Main (Control & Analy)
		"	"	"	" " " "
		"	A29	542X0	Electrical
		"	176	566X1	Environmental Support
		"	A32	591X0	Seaman
		"	"	"	"
42		"	"	"	"
		?	A33	591X1	Marine Engine
		?	"	"	" "
		AFSC	177	602X0	Passenger & HHG
		"	138	605X0	Air Passenger
		"	A50	741X1	Recreation Services
		"	01	811X0	Security
		"	186	914X1	Mental Health Unit
		"	A85	991X2	Airman Aide
		"	A121	991X7	Senior Enlisted Advisor
		"	"	"	" " "
		"	A90	995X1	Research & Development Tech
		"	"	"	" " "
		"	A122	996X5	PME Instructor

INTERVIEW SCHEDULE (CONTINUED)

TRIP	BASE & LOCATION	COMMAND	K	AFSC #	AFSC TITLE
	March 15-18,1982	TAC	100	231X0	Audiovisual Media
	Hurlburt AFB	"	106	303X2	AC & W Radar
	Fort Walton Beach	"	110	304X5	Television Equip
	FL	"	118	321X2	Weapon Control Sys
		AFCC	122	362X1	Tele Switch Equip/Elect Mech
		"	"	"	" " " "
43		TAC	70	404X0	Prec Photo Sys Repair
		"	104	545X1	Liquid Fuel Systems
		"	176	566X1	Environmental Support
		"	A33	591X1	Marine Engine
		"	86	645X0	Inventory Management
		"	"	"	" "
		"	A50	741X1	Recreation Services
		"	140	791X0	Public Affairs
		"	A97	996X0	Student Training Advisor
		"	A122	996X5	PME Instructor

APPENDIX E

MEDICAL HISTORY AND

CONSENT FORMS

CONSENT FORM

I,_____, having full capacity to consent, do hereby volunteer to participate in a research study entitled: The Development of a Strength Aptitude Test Battery under the direction of Dr. M.M. Ayoub, Dept. of Industrial Engineering, Texas Tech University, Lubbock, TX 79409. The implications of my voluntary participation; the nature, duration and purpose; the methods and means by which it is to be conducted; and the inconvenience and hazards which may reasonably be expected have been explained to me by Dr. Ayoub or his authorized representative, and are set forth on the reverse side of this Agreement, which I have initialed. I have been given an opportunity to ask questions concerning this research project, and any such questions have been answered to my full and complete satisfaction. I understand that I may at any time during the course of this project revoke my consent, and withdraw from the project without prejudice.

I FULLY UNDERSTAND THAT I AM MAKING A DECISION WHETHER OR NOT TO PARTICIPATE. MY SIGNATURE INDICATES THAT I HAVE DECIDED TO PARTICIPATE HAVING READ THE INFORMATION PROVIDED ABOVE.

		AM / PM
Signature	Date	Time

I was present during the explanation referred to above, as well as the volunteer's opportunity for questions, and hereby witness the signature.

Signature	Date

I have briefed the volunteer and answered questions concerning the research project.

Signature	Date

CONSENT FORM ADDENDUM
Development of Strength Aptitude Test Battery

You are invited to participate in an experiment entitled "The Development of a Strength Aptitude Test Battery." We hope to measure the maximum amount of weight you are safely able to lift and handle.

If you decide to participate in this study, you will be asked to perform a series of tasks at your maximum acceptable level of exertion. You will be asked to perform manual handling activities (lifting, holding, pushing, pulling and carrying) using a standardized weight lifting machine and a wooden tote box filled with assorted lead weights. In each case you will be asked to adjust the weight you handle until you reach but do not exceed you maximum acceptable load.

To determine you maximum capability, you will start at a low weight, and the weight will be increased each time you lift, until you feel that you have reached the maximum weight that you can lift without risking any possibility of injury. This is not a contest, and you will receive no reward for participation.

One series of tests will involve the use of an incremental weight lifting machine similar to those found in gymnasiums. This series of tasks will include a maximum lift to 6 feet, a maximum lift to knuckle height, a maximum lift to elbow height, and how long you can hold 70 pounds at elbow height.

The other general series of tasks will involve the lifting, holding, and carrying of a wooden box that you will fill with lead weights. The box will have some weight in it when you start. Feel free to make as many adjustments as necessary until you are satisfied that you have reached the maximum amount of weight you can safely handle. For the push/pull activities you will be asked to exert a 3 second sustained force on a load cell by pulling or pushing against a stationary object.

The medical risks involved with this testing are no different from that of lifting weights on standard weight machine devices or handling objects on your job. These pertain to muscle and bone injuries and hernia information (both male and female) or aggravation. Yo will be asked to fill out a standard medical history sheet with special interest given to musculo-skeletal problems such as back pain or injuries, broken bones, dislocations of joints, chronic muscular aches, arthritis, hernia, or hemorrhoids. We expect some muscle aches particularly upper extremity, shoulder, and neck and back areas after the tests for up to 3 to 4 days. The amount will depend on your physical conditioning prior to the testing. There is a possibility of hernia formation or aggravation or hemorrhoid formation or aggravation. If you have a history of either without surgical repair we ask that you do not participate unless you can substantiate your participation in a regualr exercise program and you have had no back problem for a six month period.

These tests are devised to relate weight lifting capability to heavy lifting job performance. We ask that you use prudent judgment as to the extent of your participation in the various tests. Consequently, we ask that you stop when you feel fatigued, and not to overextend yourself.

Records of my participation in this study may only be disclosed in accordance with Federal Law, including Federal Privacy Act (5USC62a) and its implementing regulations. Statistical data collected during the test program may be published in scientific literautre without identifying individual subjects.

No alternative means exist to obtain the required information. Your decision to participate will not prejudice your future relation with the Air Force. If you decide to participate, you are free to withdraw your consent and to discontinue participation at any time without prejudice. If you have any questions, we expect you to ask us. If you have additional questions later, we will be happy to answer them.

The supplimentary medical history check sheet for the Strength Aptitude Research Program is for informational purposes. It does not obligate you to participate in the study, but may disqualify you for medical reasons. Also, the study will not be used for job placement or prejudice your selection for career placement.

YOU WILL BE GIVEN A COPY OF THIS FORM TO KEEP.

_____ _____

Date Volunteer's Initials

PERSONAL DATA AND CONSENT FORM

ESTABLISHING CRITERION FOR ASSIGNING PERSONNEL TO AIR FORCE JOBS

NAME: _____ Date: _____
Name and phone number of individual to be contacted in case of emergency: _____

_____

Height _____ Weight _____

CHECK IF SUSCEPTIBLE TO:

Shortness of Breath: _____ Dizzyness: _____ Headaches: _____
Fatigue: _____ Pain in arm, shoulder, or chest: _____
IF SO, EXPLAIN: _____

Have you ever had a heart attach? _____ If so, give history: _____

Are you currently taking any type of medicine? _____ If so, explain:

Have you had or do you now have any problem with your blood pressure?
If so, explain: _____

In the last six months, have you had any type of surgery or serious illness? _____ If so, explain _____

have you had or do you have a hernia? _____ Corrective date: _____
Have you had your normal amount of sleep within the past 24 hours? ____
have you had your normal amount of food within the past 24 hours? _____

PLEASE READ CAREFULLY

I have truthfully answered the questions to the best of my knowledge, pertaining to my personal data. I hereby give my consent for my participation in the project entitled: Establishing Criterion for Assigning Personnel to Air Force Jobs. I understand that the person responsible for this project is Dr. M. M. Ayoub (806) 742-3407. He or his authroized representative (806) 742-3543 has explained that these studies are part of a project that has the objective of designing a test of physical strength to be used to assign Air Force enlisted personnel to jobs based on the physical demands of each job.

PERSONAL DATA AND CONSENT FORM continued

Dr. M. M. Ayoub or his representative has agreed to answer any inquiries I may have concerning the procedures and has informed me that I may contact the Texas Tech University Institutional Review Board for the Protection of Human Subjects by writing them in care of the Office of Research Services, Texas Tech University, Lubbock, Texas 79409, or by calling (806)742-3884.

He or his authorized representative has (1) explained the procedures to be followed and identified those which are experimental and (2) described the attendant discomforts and risks:

(1) Briefly these procedures are: (a) to perform simulated tasks requiring increasing physical effort until I reach but do not exceed maximum physical ability to do the task under the specified conditions and to perform test of my physical ability requiring increasing physical effort until I reach but do not exceed my maximum physical ability to do the test under the specified conditions. The physical efforts required will be simulating manual handling of objects such as lift/lower, push/pull, carry, and hold/position.

(2) I realize that the attendant discomfort will be fatigue when performing the task/tests and possible muscle soreness for several days. Additional potential risks have been explained to me as follows: muscle strain or sprains, pulled tendons, back pain or sprain, or hernia.

If this research project causes any physical injury to you, treatment is not necessarily available at Texas Tech University or at the Student Health Center, or any program of insurance applicable to the institution and its personnel. Financial compensation must be provided through your own insurance program. Further information about these matters may be obtained from Dr. J. Knox Jones, Jr., Vice President for Research and Graduate Studies, (806) 742-2152, Room 118 Administration Building, Texas Tech University, Lubbock, Texas 79409.

I understand that I will not derive any therapeutic treatment from participation in this study. I understand that I may discontinue my participation in the study at any time I choose without prejudice.

I understand that all data will be kept confidential and that my name will not be used in any reports, written or unwritten.

SIGNATURE OF SUBJECT: _____ DATE: _____

Signature of Project Director
or his authorized representative: _____

Signature of Witness to Oral Presentation: _____